TECHNOLOGY DEPT:

The Refrigeration Service Engineer

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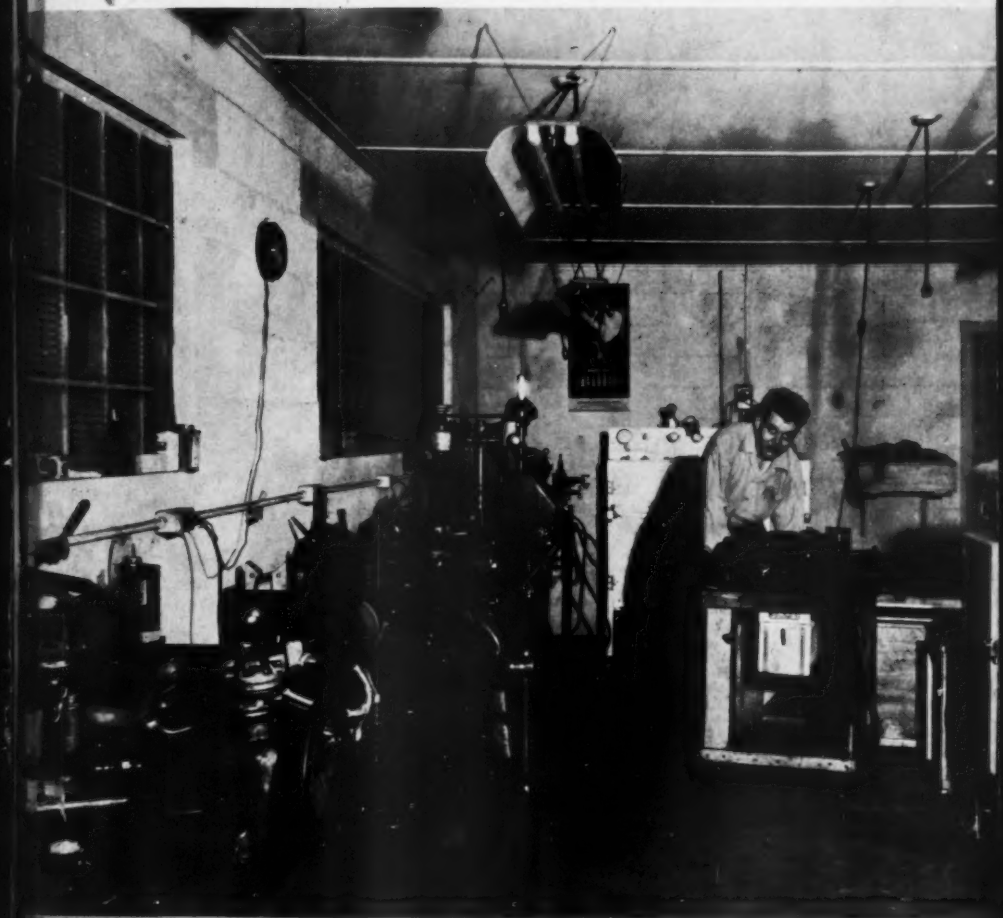
DETROIT

VOL. 14 NO. 1 ★ ★ ★ JANUARY . 1946



THE NEWCOMER IN THE SERVICE FIELD .

REFRIGERANT PHYSICAL PROPERTIES .

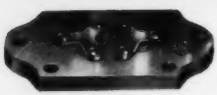
OPERATION OF ELECTRIC INSTRUMENTS .

R v. 14 1946

NO WONDER BUSY SERVICE MEN PREFER

CHICAGO SEALS . . . . . .

THEY'RE SO EASY TO INSTALL ON THE JOB EVEN IF A SHAFT IS BENT OR SCORED



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CHICAGO GENERAL REPLACEMENT SEALS

Go on refrigerator compressors in less time, with less work, and cut down "call backs."

MODERN DESIGN

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Tech

The Ansul Research Staff
REPORTS ON:

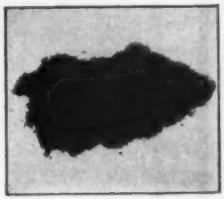
SLUDGES

Approximately 90% of the sludges produced in refrigerating systems are due to moisture. The exact cause can always be determined by analysis, but the appearance of the sludge (see photos) is usually indicative of the cause.

SLUDGE DERIVED FROM MOISTURE— If water is present in a machine, the nature of the sludge depends upon the type of refrigerant and length of time the water is present. All refrigerants ... sulfur dioxide, methyl chloride, Carrene and "Freon-12" ... react with water to produce corrosion products characteristic of each. To prevent sludge, the amount of water present in a refrigerating system must be small enough to avoid ice separation and corrosion. For "Freon-12" and methyl chloride, a quantity of water approximately .05% by weight will cause corrosion; the limit is somewhat higher for sulfur dioxide.

SLUDGE DERIVED FROM OILS—Oil sludges are characterized by total or partial solubility in carbon tetrachloride, gasoline and similar solvents. It is generally presumed that oil sludges are due to two causes: (1) an interaction between the unsaturated constituents of the oil and the refrigerant; (2) a breakdown of the oil due to heat, oxidation, friction, etc.

SEND FOR "SLUDGES,"
by Ansul Research Staff
A detailed analysis of the refrigeration sludge problem.



GRANULAR SLUDGE
... due to moisture

FLUID SLUDGE
... due to oil

HARD SLUDGE
... due to moisture and oil

*REG. U. S. PAT. OFF.

FOR REFRIGERANTS ... SEE YOUR ANSUL JOBBER ...

ANSUL CHEMICAL COMPANY
MARINETTE, WISCONSIN
DISTRIBUTORS FOR KINETIC'S "FREON-11," "FREON-12," "FREON-21," "FREON-22" AND "FREON-113"

100 YEARS *of Service*

Michael and Robert Bolda Celebrate 50th Anniversary as Employees of Detroit Lubricator Company

ON October 13, 1945, Michael and Robert Bolda, celebrated their 50th anniversary in the service of Detroit Lubricator Company, rounding out 100 years of service between them, having started with Detroit Lubricator Company in the Fall of 1895.

Mike is superintendent of the foundry, and Bob is foreman of the core room. Their work has been with the foundry for the entire time, and they have seen non-ferrous foundry methods develop from the rule of thumb control and hand labor of 1895, to the modern mechanized operation and exact scientific control of modern instruments as used today.

Careful control of metal temperatures, molding and casting conditions, as well as metal mix, has always been of first importance to Detroit Lubricator Company. Beginning with their early products, pressure and other type lubricators, and continuing through automobile carburetors to the present line of refrigeration and heating valves, their products have always required castings of perfect soundness, impervious under pressure test. When Mike took charge of the foundry, scrap losses were high and too many castings had to be remelted because they were not suitable for use. His control methods have since cut losses to a fraction of what they were.

While Mike was pursuing losses in the foundry proper,

...dern instruments as used today.

...ke's first job was mixing core sand. He had to "riddle" (sift) it by hand, and mix in the oil and other ingredients by hand shoveling. Then he had to carry it by hand, in boxes, to the core making benches. In 1902 he was given charge of the core room, and in 1910 was made assistant foundry superintendent. In 1916 he became foundry superintendent and began his work of exact control which has made Detroit Lubricator castings noted for high quality. He did it by making exact records of the best conditions for casting each type of piece—by constant experiment to improve castings.

In the early days such instruments as pyrometers were unknown. Metal temperature had to be judged by color and by "vibration" when a rod was immersed in the ladle of molten metal. Very hot metal will vibrate the rod, cool metal will not. A skilled man can check his eye judgment in this way. "Modern pyrometers are much better, however," Mike says, "because eye judgment at its best can only come within 10 degrees or so of the correct temperature, and then only under the most favorable conditions."

...use. This control methods have since cut losses to a fraction of what they were.

While Mike was pursuing losses in the foundry proper, Bob was doing similar service in making cores. Cores are baked sand shapes placed in the mold to make hollow places in castings. They are made of various kinds of sand plus some binder such as linseed oil or stale beer (in early days); or these days, scientifically mixed core oil. Making them looks as simple as whipping up mud pies, but foundrymen will tell you they are tricky. They can skyrocket scrap losses if they fail to behave properly when the hot metal flows around them in the mold.

Mike and Bob have found Detroit Lubricator Company a good place to work. So have their sons. Mike has three sons and one daughter living. One son works at Detroit Lubricator Company and the other two are in the armed services. Two of Bob's sons work at Detroit Lubricator Company and two are in the army. Bob also has a daughter.

The Boldas are, in many ways, typical of Detroit Lubricator Company people. They stay with the company, contributing their skill and experience toward making the products better as the years go by.

DETROIT LUBRICATOR COMPANY

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Compact and Efficient For Ice Cream Cabinet or Similar Small Installations

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It is designed to provide maximum heat exchanging capacity where available space is at a premium.

Special combinations of inlet and outlet fittings can be furnished so that this compact unit can be adopted to your particular requirements.

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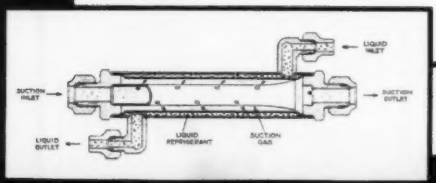
Flare Nuts and Seals are furnished with Exchanger, thus keeping units dry and clean.



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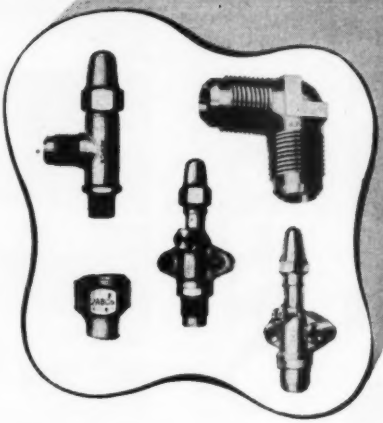

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Remember—non-refillable dehydrators are used for "permanent" installation. That makes it important to get the 3-way protection of DFN Non-Refillable Dehydrators, namely: dehydration — filtering — neutralizing. This means more efficient protection for longer periods. And, best of all, it costs no more than other types. Full range of sizes for every need.

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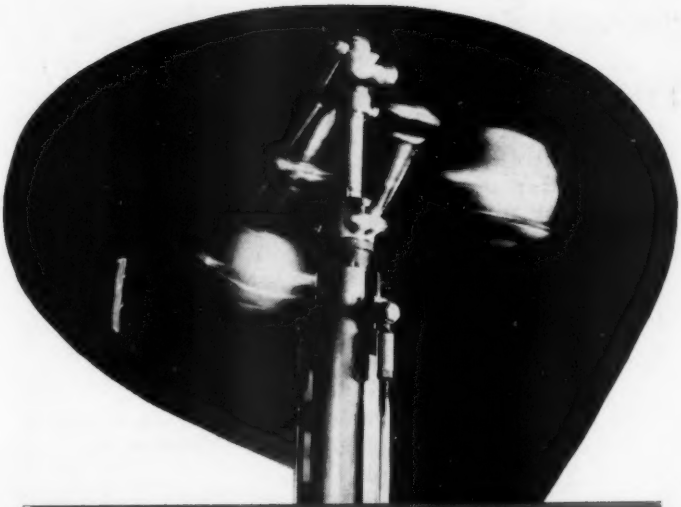

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When the pressure starts to rise or drop, the valve automatically adjusts the flow to restore the evaporator pressure to its predetermined point, independently of sudden changes in Load or Suction Pressure. It assures constant coil pressure and tends to prevent "flood-back".

Principal applications: Two-Temperature Jobs; Water Fountains, Beer and other Beverage Coolers—to keep their temperature at the

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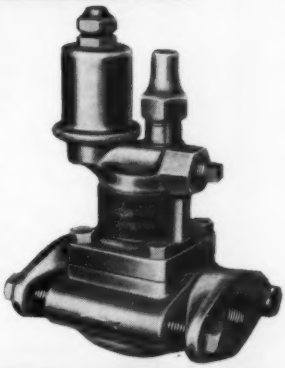

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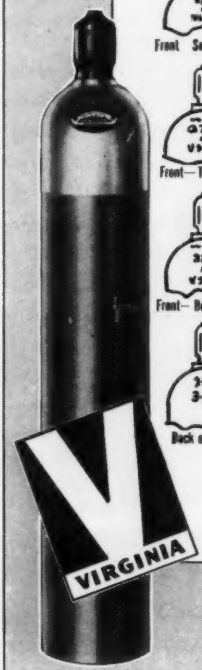
I. C. C. shipping container classification. This particular number (I. C. C. - 4B - 300) authorizes transportation of Sulfur Dioxide, Methyl Chloride, and certain other low pressure refrigerants.

This is the serial number which is used to identify the cylinder for all normal record purposes.

The letter in this position on the cylinder indicates the name of the company which manufactured the container.

These letters identify the registered owner of the container. (If complete identity of Nos. 3 and 4 row is ever required, write: Bureau of Explosives, 50 Vesey Street, New York, New York.)

Hydrostatic test date markings. The top symbols indicate a previous test date, the bottom symbols the last test date. Figures at the left indicate the month, the Letter "T" means "Hydrostatically tested"; figures at right, the year the tests were made. The law says cylinders be tested once every five years.



Manufacturers of "Virginia" Refrigerants and Distributors for Kinetic's "Freon 11"—"Freon 12"—"Freon 21"—"Freon 22"—"Freon 113".

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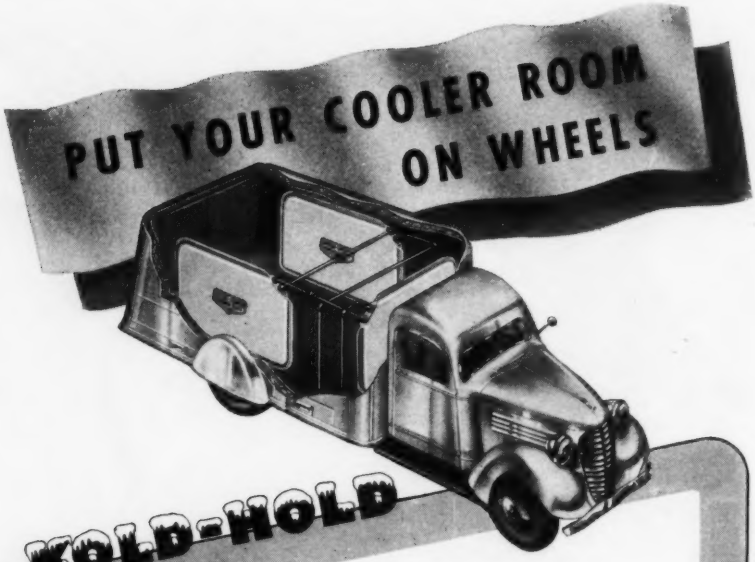

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In addition, the "Hold-Over" Plates protect your undelivered load — you leave it overnight in the truck — find it next morning as fresh, attractive, as it would be in your own cooler room.

Kold-Hold Refrigeration is simple, compact and efficient. Occupying less space inside the truck, it permits greater pay loads and longer runs.

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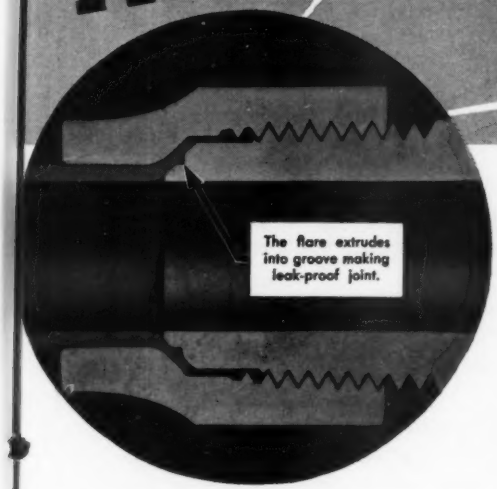

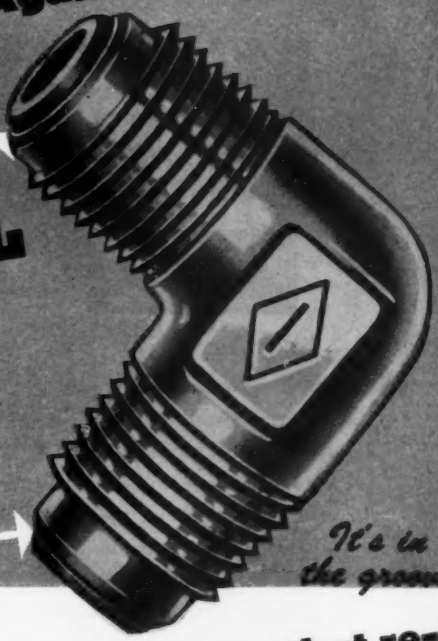

The Flare Fitting that remains LEAKPROOF even when the seat has been badly nicked or marred

The Imperial Triple-Seal Flare Fitting brings you new, extra protection against leakage in refrigeration tubing connection work.

This fitting is the same excellent SAE refrigeration type Flare Fitting you have used before *except that it has an important improvement.* It is made with a groove in the seat. When the flare is drawn up against this groove the copper tubing is extruded into the groove making a tight, self-seating joint. This joint will remain leakproof even though the face of the seat may be badly nicked or marred.

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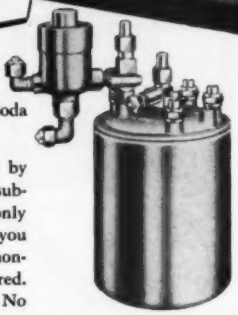

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REFRIGERATION SERVICE ENGINEERS SOCIETY

EASTERN OFFICE
420 Lexington Ave., New York 17
Telephone Lexington 2-4816

Subscription Rates United States $2.00 per year. Single copies 25c All other countries $3.00 per year

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IN THIS ISSUE—

Linked with a countrywide problem of providing full employment for the returning veteran and displaced war worker, is our own industry problem of "the newcomer in the service field" discussed on page 21. This lengthy discussion contains some of the facts and figures on the problem together with the opinions of two men who have given it serious thought. One of these men offers some concrete suggestions and ideas outlining quite definitely the requisites of various classes of servicemen. The final offering in the discussion is the apprenticeship training program suggested by the Refrigeration Service Engineers Society which provides some solution to the problems.

A portable bomb site repair shop used by the Army Air Forces is pictured on page 30. There are perhaps some suggestions here for the service engineer who is planning a portable refrigeration repair shop.

The indexed inventory system illustrated on page 31 could be profitably used as a good will offering to those home and farm freezer customers of the future.

One of the service pointers contained on pages 47 to 50 provides instructions on a rather exacting replacement and adjustment of one model frigidaire door latch. Other service pointers are equally interesting.

The third in the series on "Refrigerants —Physical and Refrigerating Properties" starting on page 36 continues with the discussion of the commonly used refrigerants providing an easily read analysis of the properties of each.

The fifth and final article in the series on the "Installation and Operation of Airtemp Conditioner" appears on page 40. It completes the detailed instructions on the removal of component parts, adding oil, removing or adding refrigerant.

More domestic refrigerators and home freezers now available to dealers are illustrated and described on pages 54 and 56.

The "Questions and Answers Department" on page 44 again contains some interesting questions and their solutions. One, for example, brings up the question of change in head pressures after installing an evaporative condenser.

"Electric Instruments Principles of Operation" by G. F. Gardener appearing on page 32 is a new series of articles describing the construction, operation and limitations of such tools as the volt meter, ammeter, watt meter and other test instruments used in the refrigeration service shop. To understand the operation of these tools is just as important as any other tools.

Under the heading of commercial selling starting on page 51 are first, an article on what one commercial dealer is doing about his customers located in the hot valleys of California; second, an article stressing once more the value of good service records; third, the appliance market in New Orleans as seen by the utilities; and fourth, the air conditioning requirements of the theatres throughout the country.

More information on the freezing of a greater variety of foods in the home will be available when leading schools of the country complete the studies being made by them now. A report by REMA on page 62 lists the schools and the foods they are now experimenting with.

THE COVER

PICTURED on the front cover is V. R. Kruse of Woodstock, Ill., in the new repair shop he recently built and occupied. Modern in every detail, the building, its layout and equipment, represent the culmination of dreams come true, which Mr. Kruse had during years of service work in "make it do" sort of shops.

Now Mr. Kruse is ready for that new era in the service field which due to the trend toward hermetic units in the commercial field, higher speeds, closer tolerances and to the newer applications of refrigeration, will require higher skills, better workmanship and wider knowledge in refrigeration application and service. See article on page 58.

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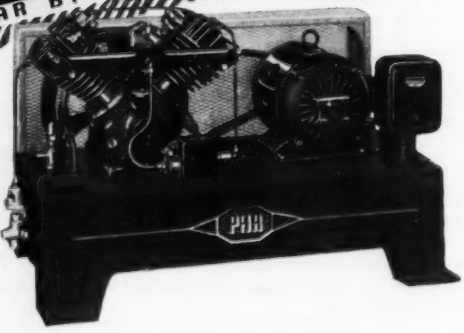

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Our Responsibilities to—

The Newcomer in the Service Field

A GREAT many men in the service field today are giving serious thought to the returning G.I. and displaced war worker, and to the preservation of service at its present comparatively higher level. Those older men engaged in the business today remember only too well the long struggle to improve working conditions in the service field and to build up the business to its present level of stabilization. They remember the "pell mell" entry into the independent field of thousands of men thrown out of work in the early 30's and the confusion that followed due to improperly trained and poorly experienced men who set themselves up in business.

It is the sincere desire of all those engaged in the field to aid the returning G.I. in every way possible to establish himself in business or find work in the refrigeration field. There is a need for a great many new men, but serious thinkers in the field propound these questions: how can the field absorb such a large influx of new men at one time without creating another period such as experienced in the 30's, which would be detrimental to both the newcomer and to the established business of today? Will there be a great deal of bitterness created when the army or navy trainee tries to get a job and finds it difficult to obtain a good living wage because of his lack of experience in the field of general service? Failing in that direction is he not likely to borrow on the Government loan plan to go into business himself only to wind up in debt and very much disillusioned within a few months? Again, because of inexperience.

50,000 Receive Schooling

It is felt that the number of new men who are planning on getting into the refrigeration service field are not too many. Before the war there were an estimated 30,000 service men in the field which were reduced to less than 10,000 during the war. If the experience of World War I is any criterion, 20% of the 20,000 who left the game for various reasons will not return for more various reasons. That leaves us with 26,000 prewar trained men in the field.

It is estimated that during the war and during the next two years a total of 50,000 G.I.'s and civilians will have received schooling in army, navy and civilian schools of refrigeration, but the mortality rate (those who never enter the game for one reason or another after leaving school) has always been quite high in civilian schools and will be much higher in army and navy schools because so many attended the classes in compliance with orders and not by choice. It is felt that of the 50,000 receiving schooling, only 25,000 will make any attempt to enter the refrigeration field. Furthermore, not all of these men will enter the service field, some will go to work as salesmen or estimators. Some will work for jobbers and many will be employed by manufacturers.

19,000 New Servicemen

As a final estimate it appears that the service field will have about 19,000 new men to absorb, bringing the total engaged in the field up to 45,000 as compared to 30,000 before the war. In view of the past expansion in the refrigeration field and future predicted expansion this should not be too many men, but their entry must be in an orderly fashion instead of the disorganized influx in the past.

There has been much publicity about the tremendous expansion and golden opportunities in the refrigeration field. The result is that men everywhere looking for a live field of endeavor, believe they have uncovered a lucrative field of high demand for their services irrespective of their training. These men should be given a thorough understanding of what they can expect and what will be required of them before spending their time and money in entering the

field, if a great many disappointments are to be avoided. Next they should be given training and a period of practical experience before they can step out as experienced service men. It follows that much more experience is necessary before they can successfully hang out their own shingle. This procedure, of course, takes time but it is the logical and most orderly advancement to better living conditions and will result in fewer disillusioned men.

On the following pages two men of the service field express their opinions on the problem of the newcomers to the field. The first of these, Don Daly of Alameda, California, is a refrigeration service engineer of ten years experience, who now operates his own business. The second—Felix Wierman is a one time superintendent of a grade school; later an instructor in a school of refrigeration, and is now employed by a refrigeration parts manufacturer.

Concluding this discussion is the recommended apprenticeship standards proposed by the Refrigeration Service Engineer Society for the service industry which to a large extent offers a solution to the problems posed by the two writers mentioned.

So You Want To Be A Service Engineer

By DON DALY

LAST night a long time friend of mine brought his 20 year old son (recently discharged from the army after three years service) to me to see if I could help him get started in refrigeration service work. He had had some refrigeration experience in the army and was very anxious to go ahead and learn the trade. I agreed to help him, of course, but when I started to tell him what the requirements were for an all around service and installation mechanic he became discouraged and said that "he had no idea there was so much to it, and wondered if it was worth the time and effort required to qualify for such a job." I assured him that it was and laid out a course of study for him to follow until such time as I can get him placed on one of my jobs.

Now I am going to do everything possible to train this boy for this job. I am going to try to impart to him in from six months to a year the knowledge and experience and all the tricks-of-the-trade that I have learned, mostly by bitter experience, in more than ten years at the trade. I know that I cannot make a finished mechanic of him in this length of time, but I can give him the fundamentals and background that will make it possible for him to become a good mechanic with time and experience.

After my friend and his son had left I began to think about all the studying he would have to do and all the things he had to learn and I began to wonder if the refrigeration service business had much to offer a young fellow.

Let us analyze the possibilities. In most cases a man must furnish his own hand tools which means a cash outlay of from $50 to $300. Then too, many jobs require a man to furnish his own car and usually he operates his car at a loss. Five cents a mile is the average allowance for a car and it just can't be done for that price. With the result that a man winds up the season with a worn out, beat up jalopy and nothing saved to replace it. It isn't fair or just, but it happens to be true.

If it were possible that these conditions would improve as time goes by it wouldn't be so bad. But in my opinion conditions will not get any better and there is every possibility that they will get worse. I believe this to be true because there are an amazing number of men, young and old, who are dead set on getting into refrigeration. They don't have the faintest idea of the difficulties they will have to overcome in order to "get in" to the game. But this doesn't seem to make any difference. They are going in anyway, and believe me "they are legion."

As I circulate around on my job hardly a day goes by but what one or more men with whom I come in contact tell me that they want to enter the game. They have, almost without exception, either taken a correspondence course in refrigeration, or they are going to take a course, or they are at present in process of taking such a course, and each and every one of them wants to know, how he can best get started.

This is a very serious situation and if something isn't done about getting these men started on the right foot we who have served our apprenticeship and become qualified journeymen mechanics, are going to be up against the worst possible kind of competition. We are going to be face to face with the same situation that confronted the automobile mechanic in the early days of the motor car. Every man who had a monkey wrench and a screw driver set himself up as an automobile mechanic. With the result that the game was ruined, not only for the would-be mechanic, but for the trained man as well. For years it was almost impossible for anyone to make a living wage in the automotive service business.

Later on the business became better organized and the public demanded better and cheaper service. Conditions rectified themselves and there are now a lot of very good jobs in the automobile service field.

Navy Trainees Want to Continue

If you think I am exaggerating about the number of men trying to get into the refrigeration service field—let me give you a couple of examples. A few weeks ago I was running a maritime commission test on a troopship installation. This job consisted of six 7½ ton Frick compressors operating fourteen boxes and fixtures at various temperatures. In addition we had about sixty package units such as water coolers, ice cream cabinets, reach-ins, domestics and etc. It took about ten days to run this test and on the first day the navy brought in their crew of twelve men who were to operate and service this equipment. Of these twelve men not one was a qualified all around refrigeration mechanic. Several of them had been to navy training schools, some had studied in their spare time, some had taken, or were taking correspondence courses. But each and every one of these twelve men were planning on working in refrigeration when they got out of the navy.

In a recent issue of "The Refrigeration Service Engineer" an article stated that one organization had trained fifteen thousand technicians for the armed services. Another article in this same magazine stated that the navy had just opened another school to train men to operate and service their air conditioning and refrigeration equipment. This school to have a capacity of several hundred students and "the courses to run about three months." Add these figures to all the other army, navy and civilian training schools and you can readily see that the number of new men about to enter the refrigeration service field is very large.

The result will be that dealers and manufacturers will have a large supply of refrigeration service men available but they may find that half trained men simply cannot get the job done, and that poorly trained men will eventually ruin their business. It isn't so good for the service mechanic, and the independent service man, because his field of endeavor will receive the black eyes for the work done by the improperly trained newcomers.

I don't know just what the answer to this problem is. I certainly would not say that anyone of these men should not go into refrigeration work. Surely everyone of them has a right to give it a try if he wants to. But it is apparent from talking to these men that they do not have the faintest idea of how much training and experience it takes to qualify a man for one of the better paid service jobs. All most of them know is that they have read it is the coming industry, and is due for enormous expansion. This is undoubtedly true. The refrigeration industry is going to expand. Every one will agree on that point, and every one will agree that there will be a lot of good jobs for qualified mechanics and a lot of jobs for apprentices. But I do not believe there is a place in the industry for too many partly trained men.

Newcomer Should Understand Problems of Field

It isn't the fault of these men that they don't know what the requirements of the service field are. They don't know that a correspondence course or a short school training course will give them only the beginning of the knowledge and training they will need to get anywhere in the business. That in many cases it is difficult if not impossible to get this knowledge and training. It is a case of having to have the experience in order to get the job—but not being able to get the job without the experience.

Therefore, I believe that it is the duty of some responsible group within the industry to make known to these embryonic service men the qualifications necessary to fulfill the minimum requirements in the various branches of the service field.

It might be a good idea to list the various branches of the service field separately, and under these headings list some of the minimum requirements for each field. For example—

1—Limited Domestic Field Service

Some knowledge of refrigeration theory and principals desirable but not essential. Job consists of placing unit in home and putting it in operation; changing units, changing thermostats, starter switches, and etc.

Job can best be learned in dealer's shop or manufacturer's service schools. This is a strictly limited job and will in most cases be concerned with the products of one manufacturer. Pay is usually not very good, but it is a good way to start an apprenticeship, and may lead to a better job; or an independent service shop, or, not too infrequently, a dealership and an independent sales and service business.

2—Unlimited Domestic Service

Thorough knowledge of refrigeration theory and principals. Job consists of service on any and all open type belt driven units. Requires detailed knowledge of the refrigeration cycle, understanding of the function of the various types of installations such as high side float systems, low side float systems, automatic expansion valve systems, thermostatic expansion valve systems, capillary tube systems, restrictor systems and etc. Requires limited knowledge of electric motors and wiring diagrams in order to diagnose electrical trouble, change thermostats, light wiring, motors and etc. Requires knowing how to cut, bend and flare copper tubing, how to attach and read gauges, how to distinguish between the various refrigerants, temperature and pressure ratios for the various refrigerators, and many other things too numerous to mention.

Pay runs from fair to very good. Job may lead to commercial service, independent service business, contract service for dealers, apartment house agents, and etc. Does not usually lead to dealership or sale because if you take any sales away from your contract dealers the boys won't like you very well.

Job can best be learned by starting as an apprentice in a large general service shop or factory branch.

3—Small Commercial Units

Substantially the same as unlimited domestic service and usually grows out of same.

4—Medium Commercial Service

This field covers all types of single and multiple unit installations up to about five tons. Job requires you to know everything in the field covered by unlimited domestic service. Plus more knowledge of electricity since you will now be dealing with 220 and 440 volt circuits as well as 110 volt circuits. Pressure controls, water regulating valves, Solenoid valves, constant pressure valves, and etc.

Requires some knowledge of pipefitting since you may have to hook up your water cooled condensers to the water service. Requires knowing how to bend and fabricate hard and soft drawn copper tubing; how to soft solder and silver braze O.D. copper and streamline fittings.

You should also have some knowledge of rigging as some of these units are large and heavy and can't be just carried in by hand. Then too, you will have to know how to build bases for your units and insulate them for sound and vibration, and a great many other things.

Job can best be learned by serving an apprenticeship in a large general service shop or factory branch. Pay good to excellent. May lead to general service business, to contract service for chain stores, creameries, apartment houses and etc., or to an installation contracting business and sales.

5—Large Commercial and Air Conditioning Installations

This covers a very large field and as a rule no one man is expert in all its branches. Usually it is broken down into three specialized branches, namely; Installation, operation and service. Each of these branches is a large field in itself. And there are any number of jobs in any of them. Some good, some not so good.

Operational jobs are fairly well paid and have the advantage of being steady all year around jobs, which is something that cannot always be said of installation and service jobs, which are frequently seasonal.

Job can best be learned by going to work as a helper or junior operator in large packing plants, creameries, frozen food plants, icemaking plants and etc.

Installation jobs are usually the highest paid of all refrigeration jobs, other than engineers. Although they are not usually very steady unless you want to do a lot of moving around.

It is possible for a man to be a good installation mechanic without knowing very much about refrigeration theory and practice. Although such knowledge is helpful.

The piping installations are usually done by steamfitters or pipefitters. The airduct

work is done by sheet metal mechanics. The electrical work by electricians. The machinery installation is usually, though not always done by machinists. So you see it just isn't possible for one man to be expert in all these jobs.

Service jobs on the large commercial installations are really the top jobs in this field. If a man is engaged in service on large plants he has a very grave responsibility. Frequently several hundred tons of food representing thousands of dollars are dependent on his knowledge, experience, and judgment. These men command top wages and if good, are usually kept on the payroll the year around.

Another job which equals the service job in pay and responsibility is that of supervisor of installation. This job requires the man to supervise the erecting of the job, put it in to operation, iron out the bugs, run the operational tests and turn it over to the owners. In some cases it entails training a crew of operators.

Requirements for this job are a combination of all the skills in the whole commercial field. It is a good job and well paid, and like any other good thing it is not easily come by. If a man comes up the hard way it will probably take him ten years to acquire the necessary know how. The only other approach would be from an engineering background.

In Conclusion

I didn't write this article with the idea of discouraging anyone. But I did write it with the idea of letting men know some of the difficulties to be met. It is my opinion that there is a splendid field of opportunity in the service business. But like all good things there isn't any easy, short cut, road to success.

Let's Help Him Get Started

By FELIX WIERMAN

MANY of the older concerns connected with the repair of mechanical refrigerators are wondering what they should do about all the new fellows going into the service business. I believe the solution is quite simple. The G.I. that is trained under the "GI Bill of Rights" should be helped to get started. The serious thinkers among them know that experience is needed along with their schooling and they're not going to finish school and open up their own service shop, only to run into some difficult job they can't handle. These men must be helped in finding jobs and getting the experience they need.

Those who do feel they can hang out their shingle as soon as they finish school will soon learn their mistake. Let's say that an inexperienced man goes out on a job—he thinks he licked it and figures—I'll go easy on the bill so if they have any other service work they'll call me—he charges $5.00. The next day he's called back and maybe several times after that for the same job. He can't charge them again, so what happened to his profit, his self-confidence and prestige. What does he say—yes, you would say it too after several such encounters; namely, "The hell with it, guess I'll get a job digging ditches or something."

There are some people who think that refrigeration is so simple that they can't realize why a man should spend years working and studying in order to gain the necessary knowledge to diagnose trouble and repair refrigeration equipment.

They wonder why an intelligent person, according to the belief of some, can't walk through a plant where refrigeration equipment is manufactured or even assembled and by keeping their eyes open and perhaps asking a few questions, gain all the necessary knowledge.

For example, let's say a man by the name of J. Jones makes a tour through some refrigerator manufacturing plant. The following might be the conversation:

Jones—How often does the fluid circulate through the system?

Mgr.—Well, it depends on several things—for example, how fast the machine is traveling.

Jones—How fast do they run?

Mgr.—That again depends on the area of the bore, the length of stroke, kind of refrigerant, etc.

Jones—What kind of refrigerant have they got in them?

Mgr.—That depends, along with other things, the temperature required.

Jones—What temperature is required?

Mgr.—Huh?

This conversation probably went on for some time. A week or so later this same manager walks down the street and sees this sign:

J. JONES REFRIGERATION SERVICE
We Service All Makes, Sizes & Models

Sounds silly, doesn't it. Well, the major part is true. How long do you think he stayed in business. You're right. Oh, refrigeration is simple. Some time back I was in a refrigeration supply house and a gentleman asked for an expansion valve. (No, he didn't get a dealer discount.) The manager asked if he had someone to install it for him. "Oh, no, I'll do it myself. I saw how the old one is put on, and it's just fastened with two nuts." (I thought to myself—it looks like the third nut is going to install it.)

Some manufacturers go so far as to print right next to the oil plug on the compressor DO NOT REMOVE THIS PLUG. You know, that's just like that old story—"Epaminondas don't step in the pie." How often have you been asked to add refrigerant to a system where someone had removed the oil plug?

The student that is mechanically inclined and really understands the theory won't have to take a back seat. The G.I. that has an urge to learn refrigeration is going to be a crackerjack, and really be an asset to our industry. Let's help him learn. Let's give him a chance to get the necessary experience so he can go into business for himself in a few years.

Then some of our so-called old-timers who work by the rule of thumb method may be in for a big surprise. If some of them were asked, "Why did you do this or that?" "That's what I did on a job like this several months ago, and it made it work," isn't a very good answer. Perhaps it wouldn't hurt if *they* had a little more theory along with all their experience.

Apprenticeship Standards for the Refrigeration Service Industry

Recommended by the Refrigeration Service Joint Apprenticeship Committee of the Refrigeration Service Engineers Society.

THE administrative body under these standards shall be the Joint Apprenticeship Committee, which shall have the duties and responsibilities as hereinafter set forth. This committee shall consist of national and local membership as follows:

Three International Officers of the Refrigeration Service Engineers Society
One member of the National Homestudy Council
One member of the National Refrigeration Supply Jobbers Association
One member of the Refrigeration Equipment Manufacturers Association
One officer of each chapter of the Refrigeration Service Engineers Society

Members of this committee shall be selected by the groups they represent. Final decision of committee matters of national scope will rest with the three International Officers of the Refrigeration Service Engineers Society, one member of the Homestudy Council, one member of the National Refrigeration Supply Jobbers Association and one member of the Refrigeration Equipment Manufacturers Association. Decisions of a local nature will be made by the above six members and the local chapter officer of the Refrigeration Service Engineers Society.

Committee members shall serve not less than two years after being selected irrespective of their official status in their respective groups. Not more than two committee men shall be replaced in any one year except when more than two resign.

Approval of Schools

The term "approved school" in these standards shall mean any vocational educational school, trade school, course of technical refrigeration training, lecture course, or training institution either private or public, that has the approval of the State Department of Education, or other state authority, and/or the Federal Apprenticeship Committee, and/or the Veterans Administration.

Consultants

Consultants on the apprentice training shall be a person or persons designated by one or more of the following:

A. Federal Committee on Apprenticeship

B. State Apprenticeship Council or Industrial Commission
C. State Board of Education

Supervisors

The local supervisor of apprenticeship shall be chosen from the membership of the Joint Apprenticeship Committee who resides within reasonable distance from the employers' places of business.

Apprenticeship Standards

It shall be the policy of this company that all apprentices to be employed by them shall be employed in accordance with the terms of these standards of apprenticeship which have been reviewed and registered with the Federal Committee on Apprenticeship or the governing body under state law in which the company is operating.

1. Supervision

Apprentices shall be under the general direction of the manager and under the immediate supervision of the shop foreman or other qualified person to whom they have been assigned. The manager is authorized to move apprentices from one operation to another in accordance with the predetermined schedule of work training.

2. Qualifications for Apprenticeship Applicants

Apprenticeship applicants before being accepted as apprentices must be able to meet the following requirements:

a. Sufficient educational requirements to master rudiments of the trade.
b. Not less than 18 years of age.
c. Physical fitness for the work of the trade.
d. American citizen or in the process of naturalization.

Special consideration will be given to returning war veterans in selection of apprenticeship applicants. These applications will be given special consideration, provided the applicants can meet the above qualifications for apprenticeship.

3. Definition of Apprentice

A refrigeration service apprentice shall mean a person who has agreed to work at and learn the refrigeration installation and service trade in accordance with these standards, and who, with his employer, has signed a written apprenticeship agreement similar to that shown in Part A of the appendix, which shall be registered with the Federal Committee on Apprenticeship, or the governing body under state law in which the company is operating.

4. Terms of Apprentice

The term of apprentice for a refrigeration service engineer shall be a minimum of 6000 hours of work experience and an additional minimum of 432 hours at the rate of 144 hours per year of related technical instruction. The work experience shall be divided into six months periods of approximately 1000 hours each, the first 400 hours being a probationary period. The total number of hours assigned to related classroom instruction or its equivalent in actual study shall not be less than 144 hours per year and such time shall not be counted as hours of work as itemized in paragraph 11 (SCHEDULE OF WORK EXPERIENCE) of these standards.

5. Credit for Previous Employment

All persons now employed as apprentices will be placed under these standards and registered with the Federal Committee on Apprenticeship or governing state body. These apprentices shall be given full credit for the time they have served as apprentices under a written or verbal agreement.

Apprentices employed who have had previous experience in the trade will be placed under these standards and given credit for time previously served upon submission to the joint apprenticeship committee of satisfactory proof from the manager and foreman or skilled refrigeration service engineer under whose charge they serve. The time an apprentice has served in refrigeration maintenance in the armed forces shall be evaluated by the joint apprenticeship committee and a credit allowance shall be given for this time.

6. Apprenticeship Agreement

The apprentice (and his parent or guardian when he is a minor) and the employer shall sign the approved agreement, a copy of which is attached. Every apprenticeship agreement entered into under these standards shall contain a special clause making the terms and conditions of these standards a part of the apprenticeship agreement.

The following shall receive copies of the apprenticeship agreement:

a. The apprentice
b. The employer
c. The Federal Committee on Apprenticeship
d. The state apprenticeship council where one exists in the state in which the apprentice is employed
e. The Joint Apprenticeship Committee

7. Ratio

The normal ratio of apprentices to skilled refrigeration service engineers shall be one to the shop and one to each five additional skilled refrigeration service engineers employed. This ratio may be changed at the discretion of the Joint Apprenticeship Committee by recommendation of the local committeeman on presentation of the shop facilities and ability of the direct supervisor of the apprentices to the Joint Apprenticeship Committee.

8. Apprentice Hours

The hours of work for the apprentice shall be the same as those of skilled refrigeration service engineers. Apprentices shall be paid over-time on the same basis as used to compute overtime pay for the skilled workmen.

9. Wages

Apprentices shall be paid no less than the following rates based on the rate paid to skilled refrigeration service engineers in the same shop:

1st period of three months: 45 percent
2nd period of three months: 50 percent
3rd period of six months: 55 percent
4th period of six months: 60 percent
5th period of six months: 65 percent
6th period of six months: 75 percent
7th period of six months: 85 percent

The above wage percentage rates shall be the minimum. In order for an apprentice to receive the above listed increases, he must show the necessary progress of the trade.

APPRENTICESHIP AGREEMENT

THIS AGREEMENT, entered into this.....day of....., 19....., between.....hereinafter referred to as the *(Name of employer)*

EMPLOYER, and....., born..... *(Name of Apprentice)* *(Month)* *(Day)* *(Year)*

hereinafter referred to as APPRENTICE, and (if a minor).....

.....hereinafter referred to as his *(Name of parent or guardian)*

(PARENT) (GUARDIAN).

Witnesseth that the EMPLOYER, the APPRENTICE and his PARENT (or GUARDIAN) desire to enter into an agreement of apprenticeship and therefore in consideration of the premises and of the mutual covenants herein contained, do hereby mutually covenant and agree as follows:

That the EMPLOYER shall employ and teach the APPRENTICE the trade or craft of REFRIGERATION SERVICE ENGINEER in conformity with the terms and conditions set forth in the apprenticeship standards of the REFRIGERATION SERVICE ENGINEERS SOCIETY and which is hereby made a part of this agreement.

That the APPRENTICE shall perform diligently and faithfully the work of the trade or craft during the period of apprenticeship, in conformity with the terms and conditions set forth in the above mentioned standards and made a part hereof.

That the PARENT (or GUARDIAN) promises that the apprentice will duly perform all obligations undertaken herein.

That the apprenticeship term begins on the.....day of..... 19....., and terminates upon the completion by the apprentice of..... (years or hours) of employment for said employer in said trade or craft.

That this agreement is subject to approval by the Federal Committee on Apprenticeship, or any other agency empowered to act in behalf of the apprentice.

That either party may terminate the agreement by submitting written notification of termination to the approving agency within 15 days prior to termination, but, if such notification is submitted after completion of the probationary period, the reasons for termination shall be given, and

That either party may at any time consult with the approving agency concerning the interpretation of any part of this agreement over which there is a difference.

IN WITNESS WHEREOF the parties hereunto set their hands and seals:

.....(SEAL) .....
(Apprentice) *(Employer)*

....(SEAL)
(Address) *(Officer)*

.....(SEAL) .....
(Parent or Guardian) *(Address)*

Registered with the Federal Committee on Apprenticeship by..... *(Employer)*

on....., 19.....

In addition to regular wages, the apprentice shall participate in any bonus plan paid to regular employees. The bonus shall be computed on the basis of the man hours times the percentage for the periods over which the bonus extends.

10. Work Experience

During the term of apprenticeship the apprentice shall be given such instruction and experience in all branches of the trade as is necessary to develop a practical skilled refrigeration service engineer. Such instruction and experience shall include adequate work in identifying parts, and rebuilding and replacing parts on all basic types of machines.

The apprentice shall also receive instruction and experience in installation layout, electrical hook-ups, and testing methods. He shall also be given reasonable and adequate work experience on any and all other types of machinery and equipment in the shop within the jurisdiction of the trade.

11. Schedule of Work Experience

The apprentice shall be given instruction and opportunity for experience necessary to develop a thorough and skilled refrigeration service engineer versed in the theory and practice of installing, repairing and servicing mechanical refrigerating equipment which shall include the following, it being understood that the schedule need not be followed in this sequence, nor that the time for a specific operation be continuous:

Schedule

KIND OF WORK	HOURS
Parts ordering and identification	**120**
Condensing Units	
Compressor repairs on valve plates, service valves, bearings, seals	440
Compressor testing for satisfactory operation	120
Compressor cleaning and dehydrating	120
Condenser repairs and cleaning	80
Motor replacement and alignment. Minor motor repairs (all operations but rewinding)	160
Motor capacitor and protector wiring and testing	120
Motor testing	80

Valves

Water valve adjustment and installation	40
Float valve adjustment and installation	80
Expansion valve adjustment and installation	160
Solenoid valve adjustment and installation	80
Refrigerant control valves, adjustment, repair, and installation	120

Controls

Thermostatic switches, adjustment and installation	80
Pressurestatic switches, adjustment and installation	80
Combination switches, adjustment and installation	80
Wiring control circuits, adjustment and installation	120
Relays and starting switches, wiring, adjusting, replacing and repairing	120

Evaporators

Installing flooded and dry expansion types	240
Repairing and reconditioning	80
Dehydrating and testing	240
Installing evaporators for various temperature applications	240

Refrigerants

Charging and discharging systems	400
Leak detection by various methods	240
Purging the various kinds	40
Determining proper charge	160
Care in handling	160
Erection for all applications	**680**
Service on all types	**1320**
Total	6000

At the discretion of the employer and depending on the aptitude of the apprentice for certain operations in this schedule, the employer shall be permitted to arrange the work schedule to use not more than 500 hours of the total time in miscellaneous related work not specifically listed in this schedule.

12. Related Technical Instruction

Where a trade school or vocational education school is within reasonable distance from the residence of the apprentice, he shall be required to enroll in and attend classes on subjects related to his trade for not less than 144 hours per year during his apprenticeship. This study must be scheduled so that not less than 4 hours nor more than 8 hours are undertaken in any one week. Further, classes shall be attended for at least 30 weeks of each year. If no provisions are available for classroom work within a reasonable distance, the apprentice shall diligently study an approved lecture or home study course covering the fundamentals of refrigeration and refrigeration service. If the related classroom work has already been undertaken and completed he shall not be required to attend classes.

13. Periodic Examination

An examination of apprentices shall be given on the completion of not more than 160 hours and on completion of each 160 hour period thereafter. In these examinations, consideration shall be given to school attendance or lesson progress, and daily employment records. In cases of failure on the part of the apprentice to fulfill his obligations as to school attendance or grades, diligence or application to his work, or shop conduct, this agreement may be suspended or revoked, with the approval of the Joint Apprenticeship Committee. The apprentice and his parents or guardian hereby agree to abide by any such suspension or revocation.

14. Continuity of Employment

The management intends and expects to give the apprentice steady employment, but reserves the right, however, to suspend apprentices for an indefinite period or to curtail their working hours whenever business conditions make this course necessary or advisable. If any apprentice is temporarily laid off because of business conditions, he shall be reinstated before any additional apprentices are employed.

At the discretion of the Joint Apprenticeship Committee the apprentice may be temporarily or permanently placed with another employer when the original employer finds it necessary to reduce his overhead due to business circumstances, or where another employer offers or has available special equipment necessary to the complete training of the apprentice.

An apprentice, suspended for any reason, or when absent on account of sickness or other excusable cause, when reinstated, or again reporting for work, must make up all hours lost before the work of the next period can be started.

15. Adjusting Differences

Apprentices are encouraged to take up individual suggestions, recommendations, or minor grievances with the manager and shop foreman. Either party to the apprenticeship agreement may consult with the representatives of the registration agencies, the consultants, or the Joint Apprenticeship Committee supervisor on any difference or problems that may arise in the apprenticeship.

16. Modification of Standards

Any modification or change in these standards shall be submitted to the Federal Committee on Apprenticeship, and/or the State Apprenticeship Council or Industrial Commission, over whose signature or signatures they are approved.

17. Certificate of Completion of Apprenticeship

Upon the satisfactory completion of the apprenticeship, a certificate designating that the apprentice has completed the apprenticeship as written shall be furnished by the Federal Committee on Apprenticeship or the State Apprenticeship Council or the Industrial Commission upon ample proof by all parties concerned that the standards have been adhered to.

18. Consultants

Consultants on apprenticeship should upon request render such assistance as will aid in improving the trade preparation of the apprentice. The manager, foreman or employer may request interested agencies or organizations to designate a representative(s) to serve as a consultant(s). Consultants will be asked to participate without vote in conferences on special problems related to apprenticeship training which affect the agencies they represent.

The recognized agencies for consultation on apprenticeship are the Federal Committee on Apprenticeship and the Board of Education.

PORTABLE WORKSHOPS SPEED REPAIR OF BOMB AND COMPUTING SIGHTS

This is a view of the inside of a collapsible workshop built for transportation by air to advance AAF bases. The workshops were used by the Army Air Forces to repair and adjust bomb and computing sights. Skilled AAF mechanics do the work on the spot, saving time required to send the instruments to rear bases. Included in the equipment is a refrigerating system needed to bring temperatures to the required level. Lightweight Fiberglas insulation in the walls helps in holding temperature and humidity. The shops were built by the Herman Body Company, St. Louis. Insulation was supplied by Owens-Corning Fiberglas Corporation, Toledo. The refrigerating system by Lynch Manufacturing Corp., Defiance, Ohio.

INDEXED INVENTORY SYSTEM SIMPLIFIES FROZEN STORAGE

HOMEMAKERS are wondering these days whether the theatrical people had as much trouble living out of a trunk as they have living out of a home freezer and what the theatrical people did about finding their things when they needed them. In their early experiences with this newest method of preserving foods at home, there is confusion and more confusion. It arises every time they are in a hurry and would like to find that package stored away last fall to serve for dinner.

For example: where is that fish that Pete caught last summer and where did I put that quail Jack wants for dinner tonight? Then too there was the time when Henry brought the boss home for dinner with a hint of fresh strawberries on the menu. After much digging and freezing of the hands it was finally decided that the strawberries were all gone so the boss had to eat prunes instead.

Many systems are being worked out and tried in the homes which help in locating the foods. Some use different colored strings, paper or labels which serve as an identification of the package when you have found it. Others use mesh bags to contain all the packages of one product.

Good labels containing such information as the kind of food, number of servings, date packed and sometimes the method of processing are a necessity in recognizing the package when it is found. There is a need also for an indexing system which would show where the packages are and a perpetual inventory which would indicate the number of packages at any time.

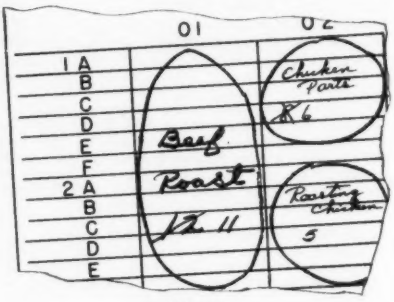
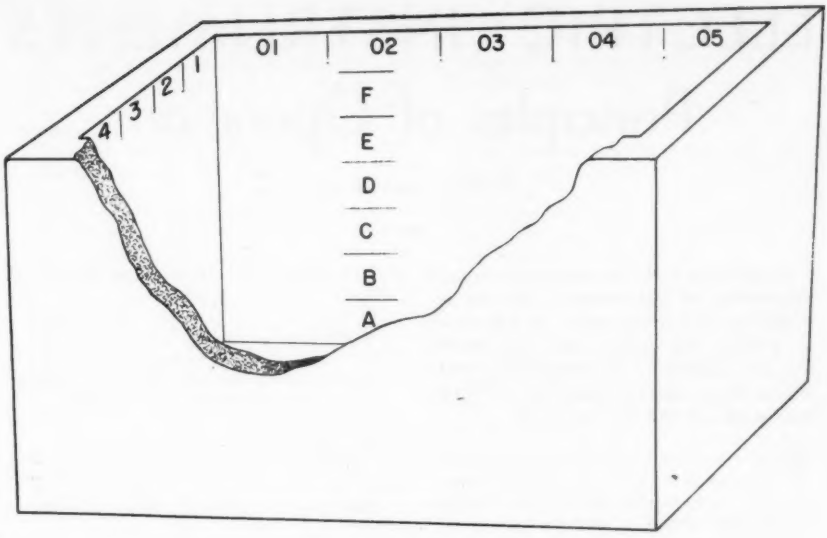


FIG. 2.

The index and inventory sheet illustrated in Fig. 1 which can be attached to the freezer or hung on a nearby wall is one suggested method of overcoming the homemaker's trouble. It is used by actually marking off the freezer as shown or using it as an imaginary sectioning of the space. As the freezer is packed, the kind of food and number of packages of each are marked in the chart as shown in Fig. 2. As packages are removed and used, the original number is crossed off and the remaining number of packages marked in.

The advantage of this system is that you can tell Henry's boss that he is going to have prunes without putting him through the painful process of drooling over the prospect of strawberries, only to be disappointed.



Home Freezer Food Index And Inventory

	01	02	03	04	05
1 A					
B					
C					
D					
E					
F					
2 A					
B					
C					
D					
E					
F					
3 A					
B					
C					
D					
E					
F					
4 A					
B					
C					
D					
E					
F					

THE REFRIGERATION SERVICE ENGINEER

FIG. 1—AN INDEX AND INVENTORY SHEET TO BE PLACED ON OR NEAR THE FREEZER.

ELECTRIC INSTRUMENTS

Principles of Operation

By G. F. GARDENER*

Familiarity with the construction and application of instruments is just as desirable as with other tools. In this series of articles the author discusses briefly the characteristics of instruments, what makes them operate, and the individual limitations of the various types.

THE use of electricity has become so general that it is taken for granted by most people. Such an attitude is logical because of the great variety of services that are performed so readily by electricity. Because of the many outstanding advantages of electric power, we sometimes overlook an important question: "Are we using electric energy in the best and most economical way?"

Sight, hearing, taste, touch, and smell will not furnish us directly with a satisfactory answer to this question. To our natural faculties we must add specialized equipment to find out what is going on in an electric circuit.

Electrical instruments are merely tools which enable us, by means of eye and ear, to obtain essential information about electric circuits. Just as with other tools, a study of the construction and application of instruments is desirable. Such a study invariably points the way to lower costs and improved manufacturing methods. To facilitate this understanding, we wil discuss briefly here the principals which govern instrument operation.

Classification of Instruments

The more common electric instruments can be divided roughly into the following classes.

According to the functions performed:

1. Ammeters
2. Voltmeters
3. Wattmeters

According to the circuit on which they are used:

1. A-c
2. D-c

According to the principle of operation:

1. Permanent-magnet moving coil
2. Dynamometer
3. Magnetic vane
4. Induction

The essential parts of these instruments generally include:

1. Means for providing deflecting torque (obtained by interaction of magnetic fields)
2. A spring or other means to provide a counter-torque
3. A pointer to indicate the resultant position of the instrument moving element

Direct-Current Instruments Permanent-magnet Moving-coil Type

The permanent-magnet moving-coil type instrument is used for direct-current measurement. Essential parts of a typical instrument of this type are shown in Fig. 1. Through pole pieces, the permanent magnet supplies a constant magnetic field across the

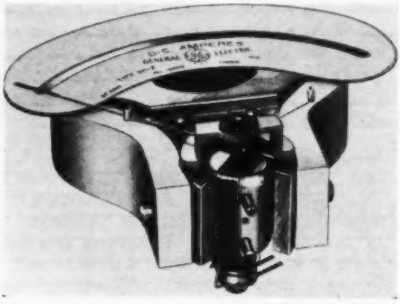


Fig. 1. Essential parts of a permanent-magnet moving-coil instrument

*General Engineering and Consulting Laboratory, General Electric Co., Schnectady, N. Y.

air gap, where a moving coil wound with fine wire is located. The moving coil is provided with hardened-steel pivots which are so fitted into highly polished jewels that the moving coil can rotate with as little friction as possible.

Springs, made of carefully selected phosphor-bronze strip, are used to lead current into and away from the moving system and also to supply restoring torque. The position of the moving coil is indicated by a pointer which moves over a suitably marked scale. The entire moving-coil assembly is made very light in weight to decrease as far as possible the load on the sharp steel pivots. In operation, the current through the moving coil produces a field which interacts with the field of the permanent magnet, and thus supplies deflecting torque.

Damping

Damping is accomplished by winding the moving coil on a light aluminum frame. Eddy currents are set up in the frame because of the motion of the coil in the permanent-magnet field. The field produced by the eddy currents interacts with the permanent-magnet field in such a manner as to oppose the motion of the coil, thus causing it to come to rest quickly.

Ammeters and Millivoltmeters

In general practice, it is not feasible to send more than 0.1 ampere through the moving coil directly; hence, to accommodate larger currents, shunts are provided as shown in Fig. 2. A shunt for instrument service is usually made from material having a very low temperature coefficient of resistance and a low thermal electromotive

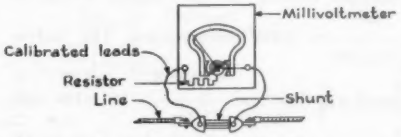


Fig. 2. Millivoltmeter with shunt.

force to copper. The low temperature coefficient of resistance is necessary to assure that the resistance of the shunt, and therefore the instrument indication will not change when the shunt carries currents which are sufficiently high to cause it to become quite warm. The second requirement, low thermal electromotive force to copper, is important, because, if the shunt terminals become unequally heated, an appreciable voltage may be superimposed on the normal voltage drop of the shunt and thus cause an appreciable error.

D-C Millivoltmeters

D-c millivoltmeters for use with shunts generally require from 10 to 25 milliamperes at from 30 to 200 millivolts for full-scale deflection, depending on the class of instrument. One common type of portable instrument requires 25 milliamperes and 200 millivolts for full-scale deflection. The corresponding switchboard instruments, which need not be held to such close limits of accuracy, require approximately 50 millivolts and 20 milliamperes for full-scale deflection.

It is important to keep in mind that the nominal shunt resistance is the value between the drop terminals; the greater (total) resistance between the current terminals is not ordinarily considered.

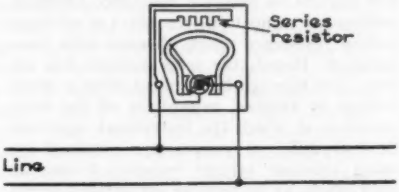


Fig. 3. Voltmeter with internal resistor

It will be noted that the instruments just described are suitable for use only on direct current because the field supplied by the instrument magnet is unidirectional. Impressing 60-cycle current on such an element will result in a torque pulsation which tends to move the instrument pointer upscale, followed 1/120 of a second later by a torque pulsation which tends to drive the pointer an equal distance in the opposite direction. Hence, the pointer merely vibrates a small distance about the scale zero point.

Voltmeters

To make a voltmeter suitable for reading d-c volts, a resistance is inserted in the instrument circuit as shown in Fig. 3. This simply limits the current to such a value that full deflection of the instrument pointer is obtained when the maximum voltage which we desire to read is applied to the instrument. For example, if we had an ammeter rated 10 milliamperes (0.01 ampere) full scale and we wished to make it a voltmeter

having a full-scale rating of 150 volts, we should require a total resistance of $\frac{150}{0.01}$ = 15,000 ohms. The milliammeter moving coil itself, of course, has some resistance, about 20 ohms; so we need to add only 14,980 ohms resistance. This resistor is

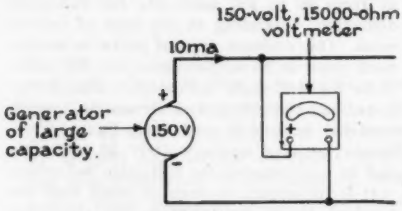


Fig. 4

made of very stable material which is not affected by ordinary changes in temperature. The amount of constant resistance added is sufficient to compensate the effect of moving-system resistance which changes with temperature. Hence, the same current will always flow through the element when a given voltage is applied, regardless of the temperature at which the instrument operates. Several different ranges are obtained by using separate tapped resistors known as multipliers, or by tapping off various points on the same resistor.

It is possible to make voltmeters that require a very small amount of current for their operation. A common type of portable instrument, rated at 150 volts, requires about 10 milliamperes for full-scale deflection. It is customary to refer to d-c voltmeters as possessing a certain number of ohms per volt. For example, the 150-volt voltmeter just mentioned, requires 10 milliamperes for full-scale deflection. Hence, its resistance must be 15,000 ohms. Since the resistance is 15,000 ohms and the full-scale volts are 150, the instrument has $\frac{15,000}{150}$ or 100 ohms per volt. Other portable voltmeters can be made which are considerably more sensitive. Some types on the market possess a resistance as high as 10,000 ohms per volt.

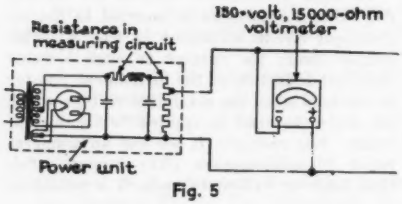


Fig. 5

Effect of D-c Instruments on Circuit

At this point, it is well to study the effect on readings which is caused by the current taken by an instrument. For example, if we have a large generator, as shown in Fig. 4, capable of delivering a large amount of power at 150 volts, the voltage drop in the source (due to the 10-milliampere current drain of a 15,000-ohm, 150-volt voltmeter) will be entirely negligible. Hence, such a voltmeter is entirely satisfactory for such measurements.

However, going to the other extreme: if we have a radio power unit, as shown in Fig. 5, which delivers 150 volts, we may find that this power unit has an internal resistance as high as 1000 ohms. If we connect our 150-volt voltmeter to the output of this unit, we shall not read the true value of its open-circuit voltage, since the total resistance through which the current has to flow will be 16,000 ohms applied across 150 volts, and the current will be $\frac{150}{(15,000+1000)}$ or 9.375 milliamperes, and our instrument will read $\frac{0.009375}{0.010} \times 150$ or 140.6 volts on scale.

On the other hand, suppose we used a 150-volt voltmeter requiring only 1 milliampere for full-scale deflection. This instrument has a resistance of 1000 ohms per volt, and, when connected to the power unit, the current flowing in the circuit would be $\frac{150}{151,000}$ or 0.993 milliamperes. The instrument will then read $\frac{0.000993}{0.001} \times 150 = 149$ volts on scale. In other words, if we seek to determine the open-circuit voltage of the power unit, and use an ordinary 100-ohms-per-volt instrument for its measure, we shall be in error by 9.4 volts, while the 1000-ohms-per-volt instrument will read the correct value to within 1 volt. The foregoing illustration does not take into account the lowered voltage of the power transformer caused by the load imposed by the voltmeter.

With this in mind, we should consider the effects which occur when ammeters are con-

nected in circuits. When the circuit is of reasonably high voltage, so that the 50 or 100 or 200 millivolts representing the drop aross the ammeter shunt are an inconsequential portion of the total line voltage, introduction of a d-c ammeter will have only a neg-

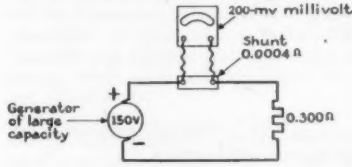


Fig. 6

ligible effect. For example, if we wish to measure the current in a 150-volt, 0.3-ohm circuit, as shown in Fig. 6, we might connect a 500-ampere d-c ammeter in the line as shown. Before the ammeter was inserted in the circuit, the line current was $\frac{150}{0.300}$ or 500 amperes. If the 500-ampere shunt was rated 200 millivolts at full load, this would mean that its resistance is $\frac{0.2}{500}$ or 0.0004 ohm (neglecting shunt - terminal resistance). When the shunt is inserted in the circuit, the current which will flow is reduced to $\frac{150}{0.3004}$ or 499.3 amperes. This is sufficiently close to the true value so that the effect of the introduction of the ammeter shunt can be disregarded.

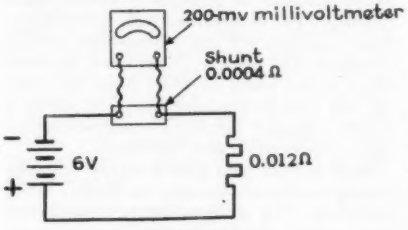


Fig. 7

On the other hand, suppose we have a 6-volt source, such as a storage battery furnishing current to a resistance of 0.012 ohm, as shown in Fig. 7. Without any ammeter shunt in circuit, the line current is $\frac{6}{0.012} = 500$ amperes. With the ammeter shunt in the circuit, the current is altered to $\frac{6}{0.012+0.0004} = 403.2$ amperes. This value, as indicated by the ammeter, compared with the original value of 500 amperes, is sufficiently in error to warrant consideration. In such cases, the resistance of the leads used to connect the shunt in the circuit must also be considered.

(To Be Continued)

A REFRIGERATOR ON EVERY FLOOR

ALMOST every American home will be equipped with a second refrigerator or a combination refrigerator-freezer within the next five years, it was predicted by James H. Carmine, Vice-President of the Philco Corporation, who spoke to the Adcraft Club of Detroit on "The Importance of Merchandising to Postwar America."

"Just as the tremendous growth of the radio industry was based on convincing the public of the advantages of having a radio in every room, household refrigeration now faces a similar opportunity," Mr. Carmine said. "The idea that one refrigerator is enough for every family is old-fashioned and out-moded. There is no reason why people should not have a refrigerator in their game room and on the second floor to save needless steps and make modern living more convenient. When this idea becomes generally accepted, it will create a market for at least 19 million additional refrigerator units.

Home Freezer Demand to Increase

"Over and above this, home freezers are increasing in popularity at an amazing rate. Within the next several years, frozen foods will revolutionize many of our eating habits. Every home offers the refrigerator industry a prospective customer for one of these new units, and Philco has just introduced the first small compact freezer, designed for use in the kitchen or pantry, and manufactured to sell at a really low price. By turning a single control, this new freezer which provides temperatures as low as 25 degrees below zero can be transformed into a second refrigerator. Previous estimates that the industry will sell 1 million freezers in the next two years now appear far too low, and we believe that this goal may be reached during 1946 if full production is attained."

Refrigerants—

(Article Three)

Physical and Refrigerating Properties

By GUY R. KING*

The data in this series of articles has been collected to give a complete comparison of common refrigerants. Sufficient data is given that an intelligent selection of the proper refrigerant could be made for the average job. It should give an operator handling a given refrigerant the most important points regarding its operating characteristics. With the advent of new refrigerants; with low pressure manufacturers adopting higher pressure Freons; and most important, with practical men being expected to take care of all classes of refrigeration equipment owned by an organization, it is of utmost importance to every refrigeration man to know something of the different refrigerants used.—G. R. K.

Methyl Chloride

THIS may be considered a synthetic refrigerant, although not one of the recent ones. Methods of making it, and its properties have been known for the last century. Its use as a refrigerant was tried and adopted as soon as some of the difficulties of sulphur dioxide began to show themselves.

Both the liquid and vapor are colorless. The liquid boils at — 10° at atmospheric pressure. Thus, colder temperatures than with sulphur dioxide are possible without a vacuum. The specific gravity of the liquid is 0.99. The gravity of the vapor is 2.04. Thus, the liquid is about the weight of water, and the vapor about twice the weight of air.

Its volume is slightly smaller than that of sulphur dioxide, so it can be handled by a smaller compressor. This is one of its advantages over sulphur dioxide. And the larger the size job, the greater the advantage. That is why methyl chloride has encroached on the use of sulphur dioxide in the commercial field more than in the domestic. It has a better evaporator pressure than sulphur dioxide because it is not as often necessary to operate at a vacuum. Its condensing pressure is low enough to be easily handled.

In its pure state methyl chloride has no effect on the ordinary metals of compressor construction. In some cases where it has been contaminated with moisture and air, it will cause an electrolytic action which will dissolve copper from the tubing and deposit it on wearing steel parts. The copper loss is never enough to cause trouble, but deposits on compressor valves or expansion valve needles may cause leakage, and deposits on rings, pistons and cylinder walls may decrease clearances to where sticking will result. Methyl chloride should never be used where zinc or aluminum are present. Methyl chloride will dissolve natural rubber, so this must not be used in gaskets or packing.

In common with other halides, it will mix in any proportion with oil and thin the oil. This has caused some trouble, but better compressor design plus the use of a heavier oil has largely eliminated trouble from this source.

It is toxic and slightly asphyxiating. It has a rather sickly sweet ether odor, but small amounts cannot be detected by smell. Small quantities can be breathed with no ill effects. Great amounts will cause drousiness, mental confusion, and nausea. It has about the same effect as too much alcoholic stimulant without the stimulation, and has been called a "methyl drunk." Greater concentrations can cause asphyxiation and even death.

Most service men prefer methyl chloride to sulphur dioxide because the former is not irritating. The small amounts released during normal installation or service work usually are not enough to be hazardous. But since it is not highly irritating, harmful quantities can be breathed unnoticed if they are present. The refrigerator owner may be unaware of its hazard, in fact, may not even connect such an odor with the refrigerator. Therefore, many authorities consider it more hazardous than sulphur dioxide. Some cities have restrictions against its use unless a

* Instructor, San Francisco Chapter, N.A.P.R.E.

warning agent is used. Acrolein (tear gas) is the warning agent usually used.

Methyl chloride may be purchased with the warning agent already added where required. Some service men have added a small amount of sulphur dioxide as a warning agent, and as a help in finding leaks. This is *not* recommended. Under certain conditions (moisture is probably a factor) methyl chloride and sulphur dioxide form a heavy sludge which is almost impossible to clean out of the system.

Methyl chloride is also inflammable. It is not as easily ignited as common fire hazards such as gasoline vapor. But the fact that it is not highly inflammable has led to carelessness which has made it hazardous. When it does burn, it forms a very irritating and toxic product, hydrochloric acid gas.

It is quite expensive, but notice it is only about two thirds the weight of other common refrigerants in its class. Since it is bought by weight but charged by the volume necessary to fill a system, the cost of a charge will not be quite as high as a direct comparison of prices would indicate. It is manufactured and sold by several different companies.

Leaks are checked with a halide torch. A slight leak will not give enough odor to be noticeable. So unless periodic checks are made, lack of refrigeration is usually the first warning of a leak.

The power required with this refrigerant is about the same as other common refrigerants. Its other properties such as critical pressure, freezing point, etc., do not place any limitations on ordinary refrigeration applications.

Thus, particularly from a standpoint of pressure and volume, methyl chloride is a little better refrigerant than sulphur dioxide. It is more convenient to handle but is not considered quite as safe. It has been used in domestic units, but at the present time is seldom used outside of commercial work. And this field it shares with sulphur dioxide and Freon 12.

Freon 12, F-12

This is the commonest of the Freon group of synthetic refrigerants. It is so common that many people do not realize there are other Freons, and do not use its identifying number. This only leads to confusion and should not be omitted.

Pure Freon 12 has a faint ethereal odor. It is almost odorless when mixed with air. The liquid and vapor are colorless. It boils at —21.7° at atmospheric pressure. The liquid has a specific gravity of 1.44 and the vapor a gravity of 5.2.

Its latent heat of vaporization at 5° is 69.5 Btu., very low compared to other refrigeraants. But the large gravity of its vapor means a given sized compressor will handle a comparatively large weight of it. Thus, although the refrigerating effect per pound is low, the size of the pound is also small, and these factors balance out. It gives 4.9% more refrigeration per cubic foot than methyl chloride, and 1.56 times that of sulphur dioxide. It gives 59% of the refrigeration produced by the same volume of ammonia.

Its evaporator pressure at 5° F. is 11.8 pounds per sq. in. gage, and its condensing pressure at 86° is 98.2 pounds. This is an excellent evaporator pressure for usual temperatures. The condensing pressure is low enough that it is easily handled.

An Excellent Solvent

Freon 12 has no effect on clean metal. It is, however, a powerful solvent, and will loosen any grease or scale that may be on the inside surface of castings, pipes, or tubes. This dirt or scale will plug the orifices in expansion valves and cause wear in compressors. Therefore, it is of utmost importance that all inside parts of the system be scrupulously clean before charging the refrigerant. Its solvent action will also dissolve natural rubber, so none of this can be used in gaskets or packing.

It will dissolve in oil in any proportion and thin the oil. With modern design it is kept separated from the oil as much as possible. This has largely eliminated troubles previously encountered.

Freon 12 is non-toxic and non-inflammable. This combined with the fact that it is almost odorless makes it safe under ordinary conditions. It will break down at high temperatures, so a leak in the presence of an open flame or high temperature surfaces will give toxic products. A halide torch must be used to detect leaks, Since it is practically non-odorous, an entire refrigerant charge may be lost in case of a leak, before it is realized something is wrong. Therefore, in a system of any size, arrangement should be made for periodic checks with a halide torch.

It is quite expensive, and the fact that it is so heavy makes a full charge even more so. Although it might be possible that prices

could be reduced in the future with new or better processes, a check of the cost of the chemicals used to make it[2] would indicate it never will come down to a price near that of the cheaper refrigerants.

Its critical temperature is 232.7°, and its freezing point —252.4°. This puts no limitations on ordinary evaporator and condenser temperatures. It has been used for special applications of over 100° below 0°, and would be suitable for temperatures even colder. Its power requirements run 4 or 5 per cent more than for those refrigerants having the least power input. This small increase is of minor consideration for small jobs, but can amount to considerable in large tonnage jobs.

Freon 12 probably has more advantages and fewer disadvantages for small and medium sized jobs than any other refrigerant available at the present time. The main points against it are the larger displacement than ammonia, slightly more power, the ease with which an entire charge can be lost before detection, and replacement costs.

It has entirely superseded what methyl chloride was used in domestic units, and is encroaching on the use of sulphur dioxide. It shares the commercial field with sulphur dioxide and methyl chloride. But it has pushed the former out in all but the smallest units, and up to the beginning of the war was taking over many of the applications which formerly used the latter. The slight swing back to methyl chloride during the war has been due to the fact that Freon 12 was unobtainable without a high priority. Its safety features make it almost an exclusive for air conditioning, and for refrigeration in places like hospitals and aboard ship.

It still has not and probably will not displace ammonia in industrial applications. Here its larger volume, increased power requirements and cost count against it. Its added safety is not considered important enough to offset all these.

Ammonia

This is the first refrigerant to be successfully used for mechanical refrigeration, and still is the number one refrigerant as to the quantity produced and sold, and as to the tonnage of refrigeration produced by it. It used to be produced from nitrates, but since World War I, the bulk of it has been produced by chemically combining nitrogen from the air with hydrogen taken from water.

It is colorless in both liquid and vapor form. It has its so well known strong irritating odor. It boils at —28° at atmospheric pressure. It is very highly soluble in water. Household ammonia is 2 or 8% of it dissolved in water. Commercial aqua ammonia is 28% ammonia dissolved in water. The specific gravity of the pure liquid ammonia is 0.66, and that of the vapor is 0.74. Thus, the liquid is lighter than water, and the vapor is lighter than air.

The very high latent heat of ammonia more than offsets its light weight. It gives 2.65 times the refrigeration of sulphur dioxide, 1.77 times that of methyl chloride, and 1.69 times that of Freon 12 for the same displacement. Its low boiling point requires a pressure on the low side for ordinary evaporator temperatures, 19.6 pounds gage at 5° F., but makes ordinary freezer work possible without vacuums. Its condensing pressure gets high enough, 154.5 pounds gage at 86°, that proper care must be taken in designing equipment to hold it. Extra heavy pipe is usually used on the high side to give sufficient factor of safety.

Ammonia Is Stable

There has been considerable argument as to whether or not ammonia is perfectly stable; whether it will break down into its elements, nitrogen and hydrogen. In some tests made, free nitrogen and hydrogen have been found in refrigeration systems. But they were usually found with other impurities too, so the nitrogen may well have come from air in the system, and the hydrogen from decomposed lubricating oil.

Under controlled tests, it has been pretty well demonstrated that pure, clean ammonia will not break down under usual operating conditions. Therefore, the bulk of the "foul gas" that may be found in a system, and used to be blamed on the breakdown of ammonia, might be attributed to other causes, particularly air leaking into the system, and oil breaking down.

It has no effect on metals if dry, but will attack and destroy any copper or copper alloy if wet. Since it combines so quickly and completely with any moisture present, even moisture in the air, it has proven very difficult to keep dry in systems the size of the usual ammonia job. Parts of the system must periodically be opened to the air for inspection or maintenance. This difficulty has

[2] Carbon tetrachloride is the raw material from which many of the halides including this one are made.

led to the design of systems containing no copper alloys. This means no bronze bearings, no brass or bronze valves, fittings or pipe. Recent developments have shown that special bronzes can be made which are corrosion proof against ammonia and water. These bronzes have been introduced into ammonia equipment in a limited way.

Pure ammonia will not have any effect on a properly refined lubricating oil. But with any moisture or acid oil, it may sludge badly. Although the ammonia has no effect on a good oil, compression temperatures must be watched. Ammonia gives a higher compression temperature than other refrigerants, 210° F. at standard ton conditions. This, and the higher temperatures of higher compression ratios, will cause the oil to break down, which means carbonization, sludge and varnish formation. Ammonia compressors must be water jacketed to limit high discharge temperature, but this will not wholly prevent it.

The critical temperature and freezing points impose no limitations on ordinary systems. But in special applications where temperatures of 100° below 0° or lower are required, some other refrigerant must be used because of ammonia's freezing point, —107.9°.

Irritating Odor Gives Warning

The irritating and toxic properties of ammonia are another feature against it. When it combines with moisture, which it does so readily, it forms a powerful caustic. This, when in contact with human flesh can cause first, second, or third degree burns according to the concentration and length of exposure. This is especially true of the moist surfaces of the eyes, nose, mouth and lungs. Any moist part of the body is instantly irritated, and with increased exposure, burned by it. It even takes place to a lesser degree on the outside skin since the skin contains moisture. Any sweaty surface of the body can be badly burned. However, like sulphur dioxide, the per cent that is irritating is much smaller than the per cent that can burn or be fatal, so it is its own warning agent.

Its irritating odor gives instant warning of a leak. The same positive leak test, the white smoke from a mixture of ammonia and sulphur dioxide, is also used. But here the ammonia is the leak, and the sulphur dioxide is supplied by burning sulphur sticks. These are made up by dipping long slivers of wood in melted sulphur. A previously prepared supply is usually kept on hand.

The Underwriters list ammonia as inflammable. But this is true within such narrow limits that this hazard is not considered great. It is one of the cheapest of the refrigerants, and it has been so well established that it can be obtained all over the civilized world. The power required to produce refrigeration with ammonia is about average. It is not over 2% higher than the lowest powered refrigerant at standard ton conditions.

Althought it is not as safe as some of the other refrigerants, in large plants it is common to have it under the supervision of engineers. Small leaks can be immediately repaired.

From the standpoint of refrigeration produced, ammonia is one of the best refrigerants on the list. Its hazardous features are the only thing against it. We find it predominating in industrial plants where the capacity is large. The average ice plant, cold storage plant, ice cream factory, wholesale creamery, or any other application of similar refrigeration requirements would not in the past consider any other refrigerant.

Before the introduction of low pressure refrigerants and automatic equipment, ammonia was used in those commercial jobs where refrigeration was a necessity. Butcher shops and creameries were its biggest such applications. Much of this old equipment has been replaced with low pressure equipment, but some of it is still in use. So, although very little ammonia equipment is now sold for such applications, there is quite a bit of it still in use.

(To be Continued)

\$ \$ \$

HOTELS TO SPEND 101 MILLION FOR REFRIGERATION AND AIR CONDITIONING

A RECENT survey made by the American Hotel Association of the expenditure needed to rehabilitate, re-equip, modernize and build additions to existing hotels throughout the country in order to bring them up to postwar standards revealed the astounding total of $1,441,159,617.

The survey was made from reports of 12,868 hotels, listed in groups according to their number of rooms. The breakdown of the survey shows that $101,144,896 is required for refrigeration and air conditioning equipment which is further divided to show that $76,203,765 will be needed for air conditioning equipment, $5,997,787 for freezers and $18,948,344 for new cabinets and other refrigerating equipment.

Installation and operation of (Article Five)

Airtemp Conditioners

This the fifth in the series concludes the articles published by permission of Airtemp Division, Chrysler Corp., on the package conditioners for stores and residences. It continues the instructions for removing parts, adding or removing refrigerant and oil, and purging air.

To Install a Compressor:

1. See that the current characteristics on the nameplate of the compressor are the same as the available power supply.
2. Remove the compressor from the shipping crate and put it in place with the support plate resting on the compressor angle supports.
3. Remove the blank flanges from the new compressor and install them on the replaced compressor. Push the compressor in position and install the cap screws which secure the support plate to the angle supports on the conditioner.
4. Attach the suction valve to the compressor using a new gasket which has been coated with Freon compressor oil. Tighten the Allen screws evenly.
5. Attach the discharge flange using a new gasket which has been dipped in Freon oil. Do not tighten the screws tight. Open the discharge shut-off valve slightly, then close it. This purges any air from the discharge line. Tighten the discharge flange screws.

NOTE: If the suction valve and the discharge flange are not exactly in line with the suction and discharge parts, the compressor must be raised or lowered slightly, by turning the hexagon nut, jut above the rubber mounting.

6. Remove the flare nut from the high pressure control connection on the compressor and attach the high pressure control tubing. Put the flare nut which is removed on the replaced compressor.
7. Connect the wiring to the compressor motor terminals, as removed. Tighten the connector and replace the cover plate.
8. Attach the water hose to the oil cooler.
9. Open the suction shut-off valve, the discharge shut-off valve and the liquid shut-off valve.
10. Test carefully for Freon leaks and correct any found.
11. Turn on the condensing water and check the hose connections for water leaks.
12. Attach suction, discharge and oil pressure gauges.
13. Close the main disconnect switch and start the compressor. If the compressor does not start, refer to "WILL NOT START" under Service Diagnoses heading.
14. Adjust the water valve until the discharge pressure is maintained at 125 pounds.
15. It may probably be necessary to add Freon.
16. Remove the gauges and gauge adapters.

Condenser

To Remove the Condenser:

1. Pump out the compressor.
2. Open the main disconnect switch.
3. Remove the Freon.
4. Shut off the condensing water and remove the inlet and outlet water hose.
5. Take out the two bolts which anchor the condenser to the supporting angles on each side, near the top.
6. Remove the control tubing leading to the water valve.
7. Loosen the two flare nuts below the water valve and remove the water valve.
8. Disconnect the liquid line at the liquid shut-off valve and at the flare nut just below the upper drain pan or at the expansion valve.
9. Disconnect the oil line from the oil separator.
10. Disconnect the flange at the top of the condenser by removing four screws.
11. Remove the discharge line and oil separator by removing four nuts at the compressor flange.

Condenser Cleaning:

The condenser coil may be cleaned by circulating a solution of Oakite No. 32 or its equivalent. A tank or barrel and centrifugal pump can be used. Circulation of the solution through the coil should be maintained until the return solution is reasonably clear. The coil should then be flushed thoroughly before actual operation is again started.

Expansion Valve

Before removing an expansion valve which seems to be stuck open, it should be "flushed" since the fault may be with dirt or scale under the valve. To flush the expansion valve, pump out the evaporator, then open the suction shut-off and liquid shut-off valve. The rush of Freon through the liquid line and expansion valve may wash out any dirt or scale. If so, the expansion valve need not be replaced. An expansion valve that is stuck may often be freed by placing a cloth saturated with hot water around the diaphragm of the expansion valve assembly. To check the expansion valve, remove the thermal bulb from the suction line. Hold the bulb in the hand and observe the suction pressure gauge. If suction pressure does not rise, replace expansion valve.

To Remove the Expansion Valve:

1. Pump down the evaporator.
2. Remove the inlet air grills.
3. Disconnect the expansion valve thermostatic bulb.
4. Remove the two cap screws which hold the expansion valve body in place.
5. Remove the power element and cage assembly.

To Install an Expansion Valve:

1. Put the new power element and expansion valve body in place with the cap screws hand tight. (Read the instructions on replacing the valve cage under operation of three and five hp. units.)
2. Open the liquid shut-off valve slightly, then close. Open the suction shut-off valve slightly, then close. This is to purge out any air which may have entered the lines.
3. Tighten the cap screws which hold the expansion valve in place.
4. Attach the expansion valve thermostatic bulb in the same position as removed.
5. Open the liquid and suction valves.
6. Test for Freon leaks. If none are found, remove the suction pressure gauge.
7. Replace the return air grille and compressor access door.
8. Close the main disconnect switch.

Fan Bearing—Fan Shaft

To Remove a Fan Bearing:

1. Open the main disconnect switch.
2. Remove the fan access door.
3. Remove the fan belt. Loosen the screws holding the motor mounting plate and pull the fan motor toward the fan pulley.
4. Loosen the set screw in the fan pulley and remove the pulley, after marking the position of the fan pulley on the fan shaft.
5. Loosen and remove the two bolts holding the fan bearing to the mounting bracket.
6. Slip the bearing off the fan shaft.

NOTE: If it is necessary to remove the bearing on the opposite end of the fan shaft, it will not be necessary to remove the fan pulley.

To Install a Fan Bearing:

1. Oil the bearing and slip it over the end of the shaft.
2. Secure the bearing to the support with the two bolts on top of the fan mounting bracket.
3. Put the fan pulley on the fan shaft.
4. Align the fan and motor pulleys using a straight edge, and secure the fan pulley to the fan shaft.
5. Replace the fan belt.
6. Replace the fan access door.
7. Close the main disconnect switch.

To Remove a Fan Shaft:

1. Remove the pulley and bearings as instructed above.
2. Loosen the Allen set screws that hold the spacer collars on the shaft and remove the collars and fibre thrust washers.
3. Loosen the two square head set screws in the hub of the fan wheel and remove the shaft. (It may be necessary to clean the paint off the shaft thoroughly in order to remove it without damaging the fan wheel or housing.)

To Install a Fan Shaft:

1. Center the fan wheel over the flat space on the shaft and tighten the two set screws making sure that they seat squarely on the flat part of the shaft. (Rock shaft back and forth while tightening screws.)
2. Replace the collars with the square face next to the bearings. (Leave set screws loose.)
3. Place the bearings on the shaft and assemble to the bearing support.
4. Space the fan wheel in the fan housing so that it is approximately centered and not rubbing on either side of the housing.
5. Move the two collars and thrust

washers up against the face of the bearings and lock in place.

6. Check for clearance of fan wheel and housing, end play in the shaft assembly and see that the bearings are assembled so that shaft rotates freely.

7. Replace the pulley and align with the motor pulley as described for installing fan bearings.

Fan and Compressor Switch

To Remove the Fan and Compressor Switch:

1. Open the main disconnect switch and remove the compressor access door.

2. Loosen the set screw which holds the switch indicator, 8, Fig. 1, to the shaft.

3. Loosen and remove the hexagon lock nut which secures the switch to the switch plate.

4. Pull out the switch assembly, holding bracket and shaft.

5. Disconnect the wires to the switch, tagging them for identification.

Determining Freon Charge

In order to correctly determine the Freon charge, the conditioner must be in operation at least five minutes and preferably longer. When the conditioner has a full charge, a noticeable change in temperature on the condenser shell can be felt with the hand or fingers, from 4 to 8 inches above the bottom of the condenser shell.

The part of the condenser 4 to 8 inches above the bottom should be filled with liquid Freon and is colder than the part in contact with hot compressed Freon gas. If the condenser shell is hot from bottom to top, or if the liquid line is above room temperature, it is necessary to add Freon.

A lack of Freon indicates a leak and all leaks must be located using a Freon leak detector or soap lather, and corrected before any Freon is added to the system. Attach the Freon cylinder to the high side by means of a charging line and up end the Freon cylinder. Purge the air out of the charging line, then open the Freon cylinder valve. Open the water valve wide. Open the shut-off valve for about one minute, then close the valve. Start the conditioner and check the Freon charge as outlined in the preceding paragraphs.

If not enough Freon has been added, stop the compressor and continue adding Freon by opening the valve for short intervals until the Freon liquid level, with the conditioner operating, is correct. If a complete charge of Freon is to be added, it is necessary to put the correct charge in the Freon cylinder before the Freon is added or to weigh the Freon cylinder before and after adding the Freon, in order to determine the quantity added.

When the conditioner has the proper quantity of Freon, make certain the valve is closed, remove the Freon cylinder, the charging line and test to see that the valve is tight and not leaking Freon.

Removing Freon

In case it becomes necessary to remove all or part of the Freon from the conditioner, it can be done in one of the two following ways:

1. If a pump out compressor is available, it may be attached directly to the compressor discharge connection or to the combination relief and hand valve near the top of the condenser. (Some models have only the high pressure relief to which a connection cannot be made.)

Shut off the condensing water supply, disconnect the flare nut in the water inlet to the condenser and loosen the upper hose in order to drain all of the water from the condenser. Open the valve; start the pump out compressor and pump the Freon into a 25 pound Freon cylinder or larger until the gauge in the pump out line shows 1 to 2 pounds pressure. Stop the pump out compressor and if the gauge pressure rises, repeat pumping out until the 2 lb pressure remains constant which indicates that all of the Freon has been removed.

Using Ice Instead of Pump

2. If a pump out compressor is not available, stop the conditioner, shut off the water supply and drain the water from the condenser as just described.

Attach an empty 25 pound or larger Freon cylinder to the condenser valve with suitable tubing and pack the Freon cylinder in ice or immerse it in ice water. Open the shut-off valve and the Freon gas will nearly all condense in the Freon cylinder. After the condenser is at a uniform temperature (this indicates all the Freon in the condenser has evaporated), close the shut-off and the valve on the Freon cylinder, then disconnect the Freon drum.

This method requires more time than the method described in "1" and further, it is impossible to remove the entire charge of Freon.

Freon Valves

There are a total of 4 shut-off valves on the conditioner. The suction shut-off valve, the discharge shut-off valve, the liquid shut-off valve, and the purge and relief valve on some models.

To open the liquid shut-off valve, remove the seal cap, turn the packing gland ½ turn counterclockwise and turn the valve stem counterclockwise as far as it will go. Then tighten the packing gland and replace the seal cap. To close the valve, proceed with the reverse of the above.

To open the suction shut-off valve and discharge shut-off valve, turn the valve stem clockwise as far as it will go and put on the seal cap. To close those valves, turn the valve stems counterclockwise.

The purge and relief valve serves as a relief valve and also a means of adding Freon, removing Freon or purging air. To open this valve, turn the hand wheel to the left or counterclockwise. The opening and closing of this valve in no way affects the spring loaded relief mechanism since it is incorporated in such a way that the relief mechanism lifts with the valve stem. In case the relief valve leaks, it must be replaced with a new valve.

Adding Oil

If the compressor has sufficient oil to get a 10 pound differential between the suction pressure and oil pressure, oil may be added through the suction gauge connection. To this attach gauge adapter less the gauge to the suction gauge connection on compressor.

Attach a ¼ inch short copper tube to the gauge adapter on the suction pressure connection. Place a quantity of Freon compressor oil in a clean, dry, container and submerge the open end of the short tube in the oil. Turn the hand wheel on the gauge adapter and purge the line.

Close the suction shut-off valve. Start the conditioner, pump compressor out. When suction pressure gauge indicates 5 or 6 inch of vacuum open hand wheel on gauge adapter 3 full turns and pull stem out of valve. Tighten packing nut on gauge adapter. After a pint or more of oil has been drawn into the compressor, remove the short copper tube, replace the plug in the adapter, open the suction valve and start the conditioner. If the oil pressure does not rise to at least 20 pounds above the suction pressure, the compressor must be replaced.

If the compressor does not have sufficient oil to get a 10 pound pressure between suction pressure and oil pressure it is necessary to use a hand oil pump and pump the oil in through the oil pressure gauge connection. A good hand pump can be secured from Airtemp, Incorporated or the Lunkenheimer Valve Company, their Universal Hand Oil pump No. 6A. If the oil pressure does not rise to at least 20 pounds above the suction pressure after a pint of oil has been added, the compressor must be replaced.

Purging Air

To determine if there is air in the system, stop the conditioner. Attach a discharge pressure gauge to the compressor and open the water valve wide. When the gauge shows no further drop in pressure, take the temperature of the condensing water.

Refer to a Freon Pressure-Temperature chart or curve and observe the pressure of Freon at the temperature of the condensing water. If the difference between the pressure indicated on the discharge pressure gauge is more than 4 pounds higher than the pressure which is indicated by the condensing water temperature, there is air in the system and it should be removed or purged.

In order to purge air, operate the conditioner at least 15 minutes, then stop it and open the water valve wide. Wait several minutes and then open the purge valve at the condenser until the hiss of escaping gas is heard. Wait one or more minutes, then close the valve and proceed as outlined in the previous paragraph. Continue purging, if necessary until the pressure indicated on the discharge pressure gauge is within 4 pounds of the pressure which is indicated by the condensing water temperature when translated to Freon pressure.

Concluded

INDUSTRY MANUFACTURING CAPACITY DOUBLED

STRIVING to meet peacetime demands the mechanical refrigeration and air conditioning industry has more than doubled its capacity over any prewar year, it was estimated today by spokesmen of the Refrigeration Equipment Manufacturers Association.

The industry's expansion includes all its products having to do with food preservation, air conditioning, and industrial and commercial uses ranging from equipment for "cold treating" metals to newly perfected water coolers and display cases.

QUESTIONS AND ANSWERS

On Problems of Servicing, Installation and Maintenance of Household and Commercial Refrigerating Equipment—Send Your Problems to the Question Box.

G. E. TOP MOUNTED UNIT

QUESTION 723: I am having trouble with a G.E. top-mounted refrigerator, type CM2-F16. It has a rotary compressor, turning counter clockwise when looking at the flywheel side. I opened the compressor with a lathe, cleaned it out, elec-welded it back together, installed a new seal, added new oil and a charge of SO_2. I used Norge refrigerator oil for SO_2. It worked fine in the shop. In a warm room the compressor runs but makes a pounding noise. Sometimes with a continuous running the evaporator reached only 20°. I have since put in different weights and volumes of oil. I now have 54 oz. of 525 Vsc. oil. With this oil change the compressor will pull 23" against a 90 lb. air pressure. As the room warms up, the compressor still gets hot and pounds, but will cycle in a reasonable length of time. This machine uses a high side float. I believe that some of the motors on these units, at least the CB2-C16 (same compressor) have an RPM of 1425. The motor on this unit has been replaced with a motor of 1725 RPM. Can you give me the correct oil charge and the viscosity used in this machine. I would appreciate any suggestions that you can give me.

ANSWER: Unfortunately we do not have the service specifications on the G.E. type CM2-F16 condensing unit. The only information we have gives the refrigerant charge as 2½ lbs. from one publication and 3½ lbs. from another.

It seems to me that 54 oz. of oil is far more than that required. Oil of low viscosity suitable for SO_2 units such as Norge should be entirely adequate for this system.

You did not state what the back pressure was when the head pressure is 90 lbs. This seems high for normal operation and may be due to an overcharge or air in the system. The operating head should be between 70 and 80 lbs. under normal conditions.

HEAD PRESSURE WITH EVAPORATIVE CONDENSERS

QUESTION 724: I recently purchased one of your head back pressure calculators and one thing is not clear, and nothing in the instruction sheet mentions an evaporative condenser. Can this calculator be used with the latest type of evaporative condenser? And what would be the proper way to find the air and water temperature setting so it could be used on the calculator for different operating conditions.

The plant I have in mind is a 40 hp. ammonia plant using an evaporative condenser of late type with spray nozzles over the condenser coils, and forced air draft up through the condenser coils on cool days or even fairly warm days (75°-80° F. outside air). This condenser will work without using cold city water. It has a circulating pump that forces water to the spray nozzles and also circulates water through the cylinder heads. Of course on hot days with high humidity some cool city water has to be used.

Under varying weather conditions there is considerable variation in water temperature compared to air temperature. The machine seldom runs over 2½ hours each on cycle. For instance the water may be considerably cooler than the outside circulated air on a morning after a cool night. And at times the water may be warmer than the outside circulated air. In some conditions the air and water temperatures may be the same.

Do you believe the calculator can be used on all these varying conditions? And how do you arrive at the proper air temperature and mean of water temperature for the second reading on the calculator. Thanking you for your ideas on this puzzling situation.

ANSWER: Head pressure on evaporative condensers are not directly computed from the head-back pressure calculator. The temperature of the condensing medium is based on the wet-bulb temperature rather than the dry-bulb or water temperature entering the condenser.

Evaporative condenser refrigerant temperatures will generally be about 20 to 30 degrees higher than the wet-bulb air temperature. Thus, you can base your estimates of proper pressures on these facts.

It should not be necessary to add city water for cooling on hot days if the condenser is large enough for the job or if it is properly designed to make full use of the evaporating water.

The calculator will have to be used in

conjunction with a wet-bulb thermometer in arriving at head pressures for this type of condenser.

GRUNOW UNIT

QUESTION 725: I have a Grunow unit (type J) which I am having trouble with. I have tried to diagnose the trouble but have not had any success.

The unit would run for a short time and the dome of the compressor would start to get very hot and the motor would become overloaded. I purged the unit but it did no good. Then I dismantled the complete unit and in doing so I noticed the stator was very badly burnt. So I cleaned all the parts and put in a rewound stator and reassembled the compressor using both new suction and dome gaskets. Also installed a new Emcee Carrene Meter. Flushed out evaporator and condensor with carbon tetrachloride. Reassembled complete unit. Put in a new charge of carrene and oil.

I put the unit in operation and it would run for a short time the same as it did at first and the lowest temperature obtainable with a thermometer on the bottom shelf of the evaporator was 45 degrees. Then the motor would start to overload again.

If I crack the flare nut on the discharge line on the compressor this would release a great pressure that had accumulated in the compressor and the motor would run for a short period again and then overload.

Then I installed the purge valve and gauge on the carrene meter to see if there was any air in the system to cause any overload. But instead of the gauge showing pressure it would pull down to from eight or ten inches of vacuum.

I left the unit lay idle for several hours and then opened the valve and the gauge would pull right down to the same vacuum with the unit idle.

I cracked the suction line flare nut at the compressor and the vacuum still held on the gauge. Also cracked union between condenser and meter to see if there was any liquid in the line and there was. Would appreciate whatever information you can give me in order to remedy this cause.

ANSWER: An analysis of the trouble you have outlined on the type J Grunow reveals that there is a complete stoppage of the line from the condenser to the Carrene meter. Obviously this must be at the inlet to the meter because liquid is present at the union between condenser and meter.

Apparently, all the charge is in the compressor dome and condenser. The reason a vacuum is indicated at the meter could be the result of the float leaking enough to have drained the meter. If this is a capillary tube, then there must be some foreign particles just at the outlet that permitted the Carrene to pass through it but will not permit reverse passage.

The temperature-pressure relationship for Carrene reveals that at 85° the pressure should be about 10 inches vacuum. This accounts for the gauge reading and may also indicate that the only stoppage in the system is between the meter and evaporator or between the evaporator and compressor.

The best way to check for such stoppage will be to disconnect each part separately and test it by blowing through the passage.

INFORMATION PLEASE

QUESTION 726: War Conditions have caused all of us in the service field to do more of our own work on compressors, motors, floats, etc. For that reason I have some questions on service and postwar activities that I would appreciate your answering for me with information at hand. My intentions are to open a reliable service shop in the near future.

1. Can you advise me of the best shop method of testing compressors for efficiency, and how to make this test bench, so when a compressor is tested for leaks, volumetric efficiency, etc., we know it will really pump out on the job. Method must be quick and positive.

2. Do you have a list of machinery companies that make machines especially for refrigeration shop repair?

3. Who's make of compressor is used on Motor Products Corp., 2301 Davis St., N. Chicago Se-42-19068, Deep Freeze?

4. Are there any other manufacturers coming out with thermal domestic and commercial refrigeration besides Electrolux?

5. Are postwar plans by most manufacturers in domestic and small-sized commercial units definitely going towards the sealed units? If so, why?

6. How are most of postwar domestic boxes planned for one, two or three different temperature compartments?

ANSWER: On a separate sheet I have prepared one method of testing compressors which I believe you will find satisfactory.

There are no particular listings of companies manufacturing machines especially for refrigeration repair shops.

Motor Products Corporation has used both Servel and G.E. units on their Deep Freeze equipment, and they have used other units to some extent, but the major portion of their business has been the service on G.E.

We have had no information relative to the possibility of other manufacturers making refrigeration systems similar to the thermal system used by Electrolux.

We are not in a position to say why manufacturers are using sealed units. Neither do we know how the postwar domestic refrigerators will be designed.

Compressor Test

Bore: .....inches Stroke .....inches
No. Cylinders: ..... R. P. M. .....

$$\text{Cu. Ft. Volume} = \frac{\text{Bore 2x .7854 x Stroke x R.P.M. x Cylinders}}{1728}$$

Actual volume will not approach the calculated volume because of the clearance volume. The actual volume will diminish as the ratio of compression increases. 70% to 80% of the calculated volume is average.

How to Test

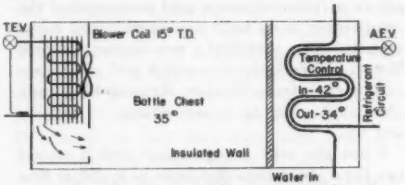
Secure a gas meter, that has been checked for accuracy, from the gas company. Attach a connection to the OUTLET and install a compound gauge in this line with a line valve between gauge and meter. Hook the connection to the compressor suction. Take meter reading before starting compressor. Run for five minutes then read meter again. The difference is the volume pumped on free discharge and at 0 lbs. suction.

Make several test runs with line valve throttled to show increasing vacuum for each run. Install high pressure gauge with valve in line to permit operation at various head pressures.

A few tests with this hook-up will enable you to judge with a fair degree of accuracy just how a compressor should perform on the system.

COMBINATION WATER COOLER AND BEVERAGE COOLER

Question 727: Included is a sketch of a water cooler (dry) and a blower coil. The water coil and refrigerant tubing come in direct contact with each other for cooling the water. An automatic expansion valve is set at 30 lbs. for F-12. Controlled by a temperature control set to cut out at 34° and in at 42°. The blower used in the bottle chest has about a 15° T.D. The cabinet is maintained at a temperature of 35°, with a TEV. It can either be controlled by temperature or pressure control. My problem is how can I hook these two fixtures to one compressor and get satisfactory results. We have two different operating back pressures. They would have to be hooked up to provide satisfactory operation in case one called for refrigeration and not the other one. I thought of using solenoids but when both of the fixtures are running the blower would be starved until the water cooler shut off.



A combined water cooler and bottle chest operating from one unit

Hoping this information is sufficient to put my point across, I am open for any suggestions that you have to offer.

Automatic and Thermostatic Valves Do Not Operate Together

Answer: Basically, your problem of trying to operate an AEV and TEV on the same system is not good engineering. In order to arrive at satisfactory operating conditions, it will be necessary to change to a TEV on the water cooling coil.

The suction line control can then be a solenoid valve in the water cooling evaporator suction. The solenoid can be operated by the thermostat now controlling the motor. This means that a pressure control must be used to control motor operation. This control should be set to maintain the desired bottle cooling temperature.

If the condensing unit has sufficient capacity, you should not have difficulty in maintaining the desired temperatures. However, if the water cooling load is equal to the condensing unit capacity, at times little or no refrigeration will be available for the dry coil. This should not be too serious as the hold-over capacity of the beverages themselves will not permit a rapid temperature rise.

SERVICE POINTERS

Practical Solutions of Your Service Problems

THIS department is an aid to service engineers who are seeking new devices or methods to improve their work. All the service pointers have been supplied by the subscribers. THE REFRIGERATION SERVICE ENGINEER invites readers to submit "down-to-earth" practical service and installation information. Five dollars will be paid for each pointer published. Every service engineer has one or more "kinks" that have proved useful in every day practice. Here is your opportunity to exchange service pointers with the other fellow and earn $5.00 for the information. Write up your idea today and mail it to the *Service Pointer Editor*.

"C" CLAMPS ARE USEFUL TOOLS

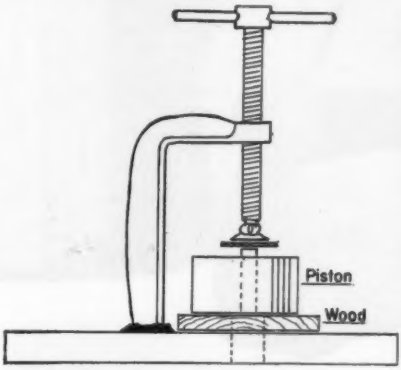
MANY shops can use an arbor press, but somehow this vital piece of equipment is lacking in many small service shops. With a large "C" clamp, such a tool can be made with a minimum of effort and cost.

Cut off the lower half of a large "C" clamp and braze or weld this to a piece of heavy iron. This will make a small arbor press suitable for light work, such as extracting wrist pins, motor bearings, etc. Small pieces of pipe can be always found in the shop and these are placed between the work and shaft and by screwing down on the screw, the wrist pin or bearing can be easily extracted.

Many times in the field, I have had occasion to remove the compressor for repairs. Due to the type of unit, I have found it convenient to leave the service valves on the job, removing the compressor to the shop. Many of these service valves, although they have been shut off tight, will leak, and in the case of SO_2 is most inconvenient. I have made a most effective gas leak emergency shut-off tool with our old friend, the "C" clamp.

This is a very versatile tool, I find, and should be in every man's service kit. Simply place a small piece of gasket material over the outlet hole, place a washer over it, and compress with the "C" clamp. The clamp is positive, not easily loosened and can withstand pressures over 300 lbs. per square inch without leakage.

In the shop, I use the same method to close off the valve outlets on the compressor with air pressure for seal leak test and put the unit under water. This takes the place of valves, which more often than not are not available in the many sizes and shapes. Try this method. You will be surprised how effective it is and the time it saves. *Submitted by Ruby Robinson, Brooklyn, N. Y.*



A small arbor press devised from a "C" clamp.

REPAIRING THE CARRENE METER

THE small meter should be opened by heating with a torch to melt the solder and unscrewing the end. Remove the old dryer material and screens. Cut the discharge line off at the tank and solder the hole closed. Drill a ¼ inch hole below the original outlet near the bottom of the meter. Silver solder the ¼ inch tube of the above assembly (without the bushing) into the hole. Install the rest of the above assembly and fill the meter almost full of silica jel, place a ball of brass or steel wool over the purge opening, finish filling with silica jel and replace the cap.

The large cap tube meter does not need to be opened. Drill a half inch hole near the bottom under the old discharge tube. Wash the meter out with carbon tet or gasoline and bake it to drive the moisture from the dryer material in the tank. Put about

(Continued on page 50)

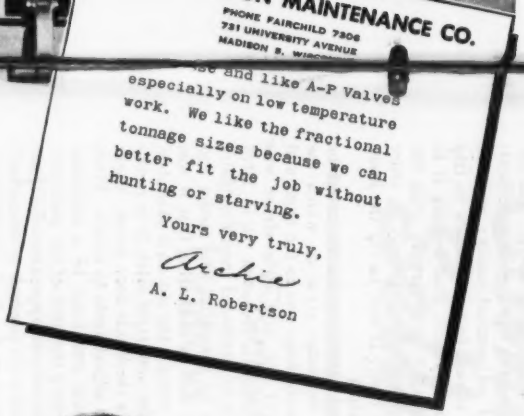
"FRACTIONAL TONNAGE
A-P VALVES FIT LOW
TEMPERATURE WORK
WITHOUT HUNTING
OR STARVING...!"
REFRIGERATION MAINTENANCE CO.
PHONE FAIRCHILD 7306
731 UNIVERSITY AVENUE
especially on low temperature
work. We like the
EXPERIENCED REFRIGERATION SERVICE

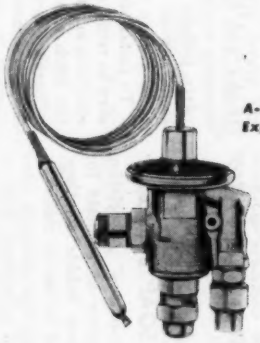
EXPERIENCED REFRIGERATION SERVICE

Engineers like Mr. A. L. Robertson, of the Refrigeration Maintenance Company, Madison, Wis., give full credit to "A-P Dependable" Refrigerant Valves for their special adaptation to low temperature work. They find that "A-P" fractional tonnage sizes for Freon or Methyl Chloride refrigerant applications make it easier, as Mr. Robertson states, to fit the job without necessity of "hunting" or "starving" the line.

Offering a wide range of adaptability, any standard A-P Refrigerant Valve can be used on Air Conditioning, Commercial Temperature and Low Temperature work without special attachments or without changing valves. Thus one standard A-P Valve fits a variety of applications.

Write for Illustrated Bulletins covering A-P Refrigerant Valves.





A-P Model 205 Thermostatic Expansion Valve. Capacity, up to 1 ton Freon.

AUTOMATIC PRODUCTS COMPANY

2434 N. 32nd Street, Milwaukee 10, Wis.

Export Dept. 13 E. 40th St., New York 16, N. Y.

DEPENDABLE *Refrigerant Valves*

Stocked and Sold by Good Refrigeration Jobbers Everywhere — Recommended and Installed by Leading Refrigeration Service Engineers

Repairing Carrene Meter

(Continued from page 47)

one-half pound of silica jel in the tank through the half inch hole, install the assembly as with the small meter and close off the old discharge outlet.

A meter rebuilt this way is better than the original and is about as good as the best replacement meters available (sometimes). The capulary tube can be easily removed for cleaning or replacing and the meter is a large dryer which will eliminate moisture trouble in a clean, tight system. *Submitted by C. L. Carter, Pueblo, Colorado.*

SUPER-TOUGH SOAP BUBBLES

THE Glycerine Producers' Association has received a number of requests for glycerine-toughened soap bubble solutions. Far from being limited to use in children's bubble pipes, such soap film solutions have many applications such as locating leaks in refrigerating systems and in solving intricate engineering, combustion, and other scientific and technical problems. One such solution, given in the "Handbook of Chemistry and Physics," is made from:

Pure castile or palm oil soap.....1 oz.
Distilled water .....8 oz.
Pure glycerine .....4 oz.

Cut the soap into thin shavings and dissolve in water. When solution is complete, add the glycerine and mix thoroughly. On standing the liquid becomes clear at the bottom. This clear portion is removed by a siphon and keeps indefinitely.

A somewhat different solution was reported to be most satisfactory for airplane beam investigations. According to B. Wheeler in the *Wisconsin Engineer*, tough soap films can be made by adding a very small quantity of triethylamine oleate to a fifty per cent solution of glycerine in distilled water. Films of this substance, he stated, would often last throughout an entire working day.

REPLACING FRIGIDAIRE LATCH

ON MANY of the early 1936 Master and Deluxe model Frigidaire domestic refrigerators having a push-button type latch, the latch roller arm was hinged toward the back of the machine, and the toggle action travel was short and rather sharp. The adjustment of the latch was extremely critical; it got out of adjustment easily; and the toggle action release had a tendency to trip before the door opened; thus causing it to lock and making it necessary to push the button all the way in very firmly in order to release the lock. It was, to say the least, very exasperating

This old style latch mechanism could be replaced by the later style on which the roller toggle arm hinge was to the front and the travel over the new style strike was longer and easier. The new style latch assembly could be purchased from Frigidaire parts jobbers by specifying the model and serial number and by indicating that it was to be used to replace the old style assembly.

To install the new style latch it is necessary to remove the inside door panel. There are three main adjustments to watch. First, the latch release arm must be a minimum of barely touching the back of the push-button and a maximum of approximately 1/16" from it in order to prevent a "bouncing" door or to effect easy release of the latch. This is a trial and error aljustment which may be first approximated by measuring the depth of the slot into which the arm fits. The lock nut should be firmly set after final adjustment to prevent working loose later. This is a mean adjustment to make without practice so it should not be slipshod.

The second adjustment is the transverse position of the mechanism which is easily accomplished before the door panel is replaced. On closing the door the latch roller should first touch the strike (new style) at the beginning of the incline and not on the point. This starts the latch action smoothly. The third adjustment, of course, is the position of the strike, which is also relatively simple. It should be such that the door closes easily yet latches with an airtight gasket seal.—*Submitted by H. D. Kuhl, Fort Douglas, Utah.*

200 NEW FIRMS MAKING FROZEN FOOD EQUIPMENT

ONE of the industry's most interesting and widely-publicized current developments is the growth in the manufacture of equipment used in freezing foods.

A late tabulation shows that more than 200 additional companies recently have entered the frozen food equipment field.

Commercial Selling

How to increase business by doing a more effective job of selling

Overpowering of Commercial Units in Hot Valley Builds Future

By ROBERT LATIMER

IT IS often part of the commercial refrigeration engineer's job to risk a little irritation *now* for a lot of goodwill later on, according to Ray Haselbo, partner in Weir Refrigeration Sales & Service, Vallejo, California.

"We've found it pays to expend a lot of skilful salesmanship on selling the right job for a particular situation, even if the customer refuses to see it that way," Mr. Haselbo grinned. "When it would apparently be a much easier course to go ahead and sell him what he wants, and forget about it thereafter. However, in conducting a large-scale commercial refrigeration business we're aiming for the market ten and fifteen years in the future, not the 'lush business' possible right now—and the only way to make a go of this is to hammer down customer's resistance to apparently over-expensive features and sell him the correct refrigeration for the service he expects to get from it."

This applies to every phase of refrigeration from air-conditioning to emergency repair calls, according to Mr. Haselbo—but particularly to the installation of walk-in boxes, reach-in refrigerators and deep freezers in retail stores, restaurants, cafes, meat markets and other outlets. The Vallejo concern is specializing particularly in this type of sales and installation, since the management feels that the generally favorable attitude of California food retailers toward increased use of refrigeration makes this an unusually fertile field. Therefore the largest percentage of its manufacturing facilities in Vallejo and sales operations in outlying California towns is directed at the small retail store.

In every engineering job, Weir salesmen and installation men are "selling the prospect on overpowering the job." "Selling customers located in hot California Valleys such as the San Joaquin and Imperial Valleys is a perfect example of our sales psychology," Mr. Haselbo pointed out. "Since invariably we spend extra time and effort convincing the prospect that the wise thing for him to do is to buy an over-powered refrigeration unit to meet the 100-110 degree summer temperatures under which it will have to operate. Since larger compressors, condensers, fans, etc., naturally cost more, this attitude creates our major sales problem—but one on which we're willing to expend plenty of effort."

Ninety-five percent of the installations which Weir has sold to date in such areas are "overpowered" to meet heavy heat loads; each job a credit to good salesmanship. "We know that the standard factory job built for general refrigeration will not do in these valleys," Mr. Haselbo added. "Therefore we ask each customer to pay the extra expense of a ⅓ horsepower compressor where ¼ is usually used, or a ½ where ⅓ horsepower is factory specification. We point out that

high heat loads will wear out standard units too fast in the valley areas where they would be more than adequate on the coast, and in one way or another, convince the prospect that we won't sell him until he allows us to install the proper job."

Although larger condensers on larger units usually solve condensing problems automatically, Weir Refrigeration Sales & Service frequently specifies extra-large separate condensers on which customers must be sold first. "If there isn't much ventilation we harp on that until the customer lets us install a water-cooled condenser," Mr. Haselbo indicated. "And if the use load is extremely heavy, we insist on putting in an increased size condenser and building duct-work and blowers for it. Every such job creates special problems as no two are alike. The only similarity about them is that it is hard to sell the buyer on spending the extra money for this equipment at all times—but we take that as a matter of course, use every argument possible, and usually wind up successfully. It is our intention never to install a refrigerator which will break down in two or three years; thus if the prospect won't cooperate, we won't install anything."

The only exception to this universal extra-cost resistance is the growing number of retailers who understand refrigeration; some of them even capable of repairing and regulating their own. In general, however, a little knowledge is worse than none, Mr. Haselbo has found. "Some customers feel that they know enough about refrigeration to lay out their own equipment, and that our proposed overpowering of the unit is an attempt to gouge extra profits." Mr. Haselbo grinned, "The only way to get around this is to show plenty of figures on refrigerator breakdowns in hot weather, pictures of well-engineered jobs, and testimonial letters from other men in the same business. We're going to keep a record on every overpowered job we sell as against others operating in hot valleys with standard compressors. The chances are that four or five years from now, these records will be our most potent selling tool."

Invoice File Eliminates Profitless Callbacks and Ill Will

By HERBERT HANLEY

ONE wartime idea which Herman Somers of Somers Appliance Company has attached permanently to his operations is an alphabetical file record of every service call handled.

Doing around $20,000 per year in complete appliance service during the war, Mr. Somers is going into peacetime appliance merchandising on a service basis—advertising carrying the slogan "Buy From the Man Who Can Repair Your Appliances." Although the seven-man wartime shop crew will be reduced to four men, he expects service to pay all overhead as well as attracting thrifty-minded housewives when competitive selling conditions reappear.

The first thing Mr. Somers did following V-J Day was to "streamline" his service operations. This included cutting out weak spots which had cropped up during the war.

One of the worst of these was profitless callbacks when an overhauled refrigerator or washing machine went bad, requiring already-swamped mechanics to make a return trip for additional repairs. The store gave a 90-day guarantee on all work, but since some of them were inexperienced and records were haphazardly kept, Mr. Somers had to go ahead with the callback repairs without knowing who was at fault.

Since January of 1945, however, one file has been used to record all jobs done outside the shop by invoice number—extracted at the end of each days' business. The number of the invoice, plus the name, address and date, goes on a 4 x 6 inch file card alphabetically, listing also the make of appliance and the work done.

Filed away daily, these cards give a complete back-check on any job when a customer calls in complaining that her refrigerator "which you fixed only a few weeks ago" has stopped operating. Without leaving the phone any Somers employe can flip through through the cards, get the right one, and tell the customer calling when the job

was done. More than half were done more than three months before—a fact which few customers can argue with. "We extend free callbacks where we feel that they are deserved," Mr. Somers pointed out. "But a large percentage of them are unfair requests on the customer's part, when we cannot afford to waste a minute in the day. We thus charge for callbacks at the same rate as the original repair if an inspection reveals that the breakdown is not our fault."

During the war Mr. Somers estimates he lost as much as $200 a month in gross revenue due to this factor, which certainly will not enter into his peacetime operations.

LARGE APPLIANCE MARKET SEEN IN NEW ORLEANS

WITHIN two years after merchandise returns, 39,600 electric refrigerators are expected to be sold in New Orleans, executives of New Orleans Public Service, Inc., gas and electric utility company, told appliance dealers of the Crescent City.

The figures were released during a banquet given appliance dealers on October 30 by New Orleans Public Service. They are based upon preliminary results of a consumer buying intention survey made in New Orleans by the Louisiana State University Business Research Bureau for the Committee for Economic Development.

The forecast showed that a total of 152,000 gas and electric appliances will be purchased in New Orleans during the initial two-year selling period, for a collective volume sales figure of $16,723,960. Broken down, this is the post-reconversion selling picture for New Orleans as indicated by the CED figures:

Of the 39,060 refrigerators which will cost $6,303,160, a total of 29,360 costing $4,682,460 represent the first preference for expenditures for such appliances by New Orleans.

Electric washing machines come next as New Orleans' postwar favorites with 42,440 to be bought, at a cost of $5,445,240, and with 26,260 machines, costing $3,347,200, listed as first preference.

Gas ranges rank third, with 17,740 to be purchased, at a cost of $1,738,000 and 7220 as first preference, costing $661,200.

Other items include: Radios—14,940 costing $1,150,040; vacuum cleaners—4680, costing $299,700; freezers—1260 totaling $320,000; electric ironers—1580, valued at $128,840; gas heaters—4280, costing $108,820; electric sewing machines—7100 totaling $663,780; electric irons — 11,140, costing $103,000; electric dishwashers — 1240, total cost $210,300; and electric fans—6540 costing $242,820.

A great part of the speech-making was devoted to a sort of publicity in reverse, with the NOPSI executives emphasizing the appliances that the company no longer will sell—refrigerators, washers, ranges, water heaters and vacuum cleaners. These major appliances have general public acceptance and there are sufficient dealers to handle their sales, the speakers declared.

Speakers included J. R. Guidroz, director of the company's residential and home service division; J. M. Guillory, manager of the commercial and industrial division, and C. B. Wilson, acting manager of the sales promotion and research division. E. N. Avagno, manager of the dealer sales division, presided.

THEATERS ARE A GOOD MARKET FOR AIR CONDITIONING SALESMAN

COMPLETE air conditioning is the number one item for theater owners planning the remodeling or building of new theaters, Mason Rapp, one of the nation's leading theater architects, told the Refrigeration Equipment Manufacturers Association.

The architectural firm of Rapp and Rapp, established in 1906, designed all of the Balaban and Katz and Warner Bros. theaters in Chicago and many others throughout the country. Now under contract to Warner Bros., the firm is planning extensive remodeling and building in cities and small towns in the midwest. Actual work is expected to begin on many of these projects about the first of the year.

Mr. Rapp pointed out that prior to the war only 12.5 per cent of the 18,000 theaters in operation were air conditioned, and many of these had improvised systems which merely cooled the air. The more elaborate systems were to be found for the most part in the larger houses.

He asserted that air conditioning was making great strides just before the war, and the public's appreciation of the comfort and safety it affords has grown appreciably.

Both the developments achieved and public demand, he said, should prove vital fac-

(Continued on page 64)

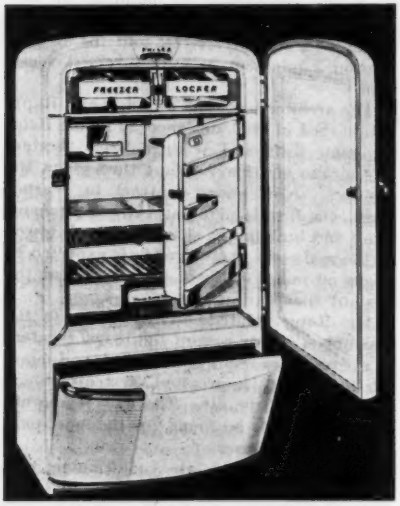
New Refrigerators and Freezers Ready for Dealers Display

RECENT issues of this journal contained some of the new model refrigerators and home freezers now on display on many dealers floors. Illustrated in this article are two more domestic refrigerators and two home freezers, made ready since publication of the previous articles on these appliances.

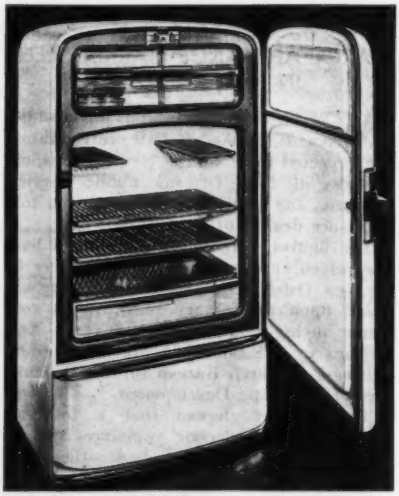
Philco Refrigerator

There are 12 newly-designed post-war refrigerators being introduced by Philco. These range in size from the 9-foot advanced design with 16.4 square feet of shelf space, large freezer locker, Conservador shelf-lined inner door, and capacity of 84 ice cubes to Model 622 with 13.3 square feet of shelf space, large freezer locker, and ice capacity of 56 cubes. Every model in the Philco refrigerator line includes a large freezer locker, which the company offered the public in 1940, "Easy Out" ice trays, vegetable crisper, covered meat storage compartment and vegetable bin.

All the new refrigerators incorporate the hermetically sealed power unit. This unit gives surplus power and extra-fast freezing, new quietness of operation and freedom from vibration.



Philco refrigerator model 752 "Conservador" 7 cu. ft. storage space. Contains freezer locker, moist cold compartment, cold shelf, crisper drawer, meat storage compartment and a vegetable storage bin. Four easy-out ice trays contain 56 cubes.



Admiral Dual-Temp model TD 946 refrigerator —one of the 6 models being produced by the company in three groups of two sizes (7 and 9 cu. ft.) each.

Admiral Dual-Temp Refrigerator

The Admiral Dual-Temp refrigerator features a spacious two cubic feet separately insulated freezing locker maintaining a zero temperature for proper storage of frozen foods, and capable of a minus zero temperature for the actual freezing of foods.

This freezing locker will hold approximately eighty pounds of food. It will keep ice cream frozen and ready to serve. It will freeze an abundance of ice cubes in a minimum time. It will not have to be defrosted more than two or three times a year. It is located in the upper part of the refrigerator where it is most accessible. It is separated

FOR *Lasting* PROTECTION USE THESE HENRY STRAINERS

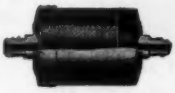
The protection these Henry Strainers provide for suction and discharge lines is complete, positive and long lasting. Screens are so securely held in place that by-passing is impossible. Foreign particles in a system are permanently trapped before they can impair efficient operation or cause damage to control equipment or internal compressor parts. And Henry screen areas are so generous in size, and free areas consequently so extensive, that there is no appreciable pressure drop even after long periods of service.

Maximum protection against leakage is inherent in the design and construction of Henry Strainers. The brass shells on Types 890, 891 and 892, for example, are drawn in a die, with a soldered cap only on the inlet end. The Type 866 Angle Strainer has a patented, distortion-proof flange which not only prevents leakage, but permits cleaning the screen without removing the strainer from the line. Fittings and connections are all silver soldered, and possess more than sufficient strength to withstand all installation strains.

ASK YOUR JOBBER . . . HE ALSO RECOMMENDS HENRY STRAINERS

Soldered Shell Strainers

TYPE 890
Screen area, 4 sq. in.



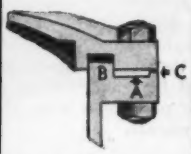
TYPE 891
Screen area, 11.5 sq. in.

TYPE 892
Screen Area, 26 sq. in.

ANCHORED SCREEN PREVENTS BY-PASSING

Angle Strainer with Solder Connections

TYPE 866
Removable screen. Screen area, 23 to 85 sq. in.



PATENTED FLANGE IS DISTORTION-PROOF

Strains due to uneven or excessive bolt tightening are absorbed in recessed area (A) and cannot be transferred to flange gasket face (B). Outer flange rim lip (C) acts as "stop" to prevent excessive drawing up of bolts.

PATENTED SPRING DESIGN PREVENTS BY-PASSING

Strong spring (A) provides positive tight sealing action of screen cartridge collar on end of shell (B).

HENRY VALVE CO.

HENRY VALVE COMPANY 3260 WEST GRAND AVENUE, CHICAGO 51, ILL.

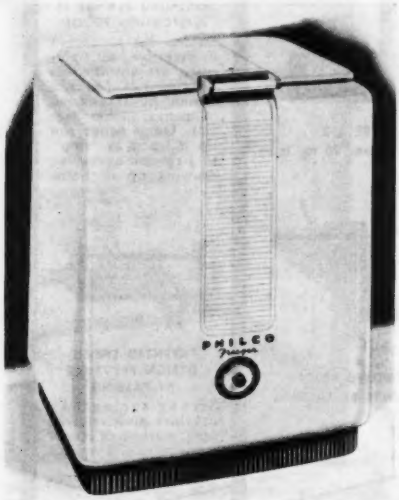
PACKLESS AND PACKED VALVES • STRAINERS • DRYERS FOR REFRIGERATION AND AIR CONDITIONING
AMMONIA VALVES • FORGED STEEL VALVES AND FITTINGS FOR OIL, STEAM AND OTHER FLUIDS

from the lower compartment by thick insulation so that the food in the compartment is never affected by the zero temperature of the freezing locker.

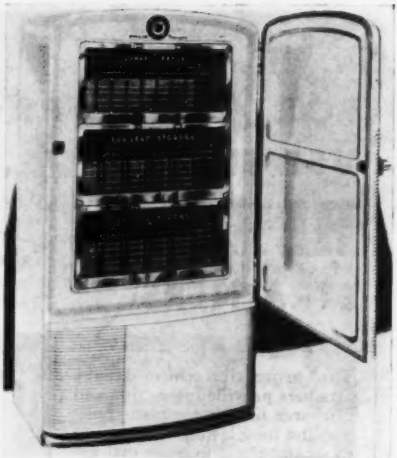
Beneath the freezing locker is a large purified Moist Cold compartment for the storage of fresh foods, beverages, etc. Because of the absence of the ordinary type evaporator, there is never any need for defrosting this compartment. The Moist Cold compartment maintains high humidity (85%). This eliminates drying out of foods and the necessity for covering foods. It keeps foods fresh and in their best condition.

So that foods may have the advantages of this high humidity without danger of food spoilage, the Dual-Temp's Moist Cold compartment has the Sterilamp, science's newest development for the safe-guarding of foods in the home. Ultra-violet rays of the Sterilamp kill bacteria, retard mold growth, and help to eliminate odors in the refrigerator.

A temperature of 38° is maintained throughout the Moist Cold compartment, and there is adequate space for even the tallest beverage bottles. Shelf adjustments make possible a wide choice of space arrangements.



Philco chest type freezer model AH 25 is a 2½ cu. ft. freezer suitable for apartment use. Designed for temperatures 15° to 25° below zero. Also made in 5 cu. ft. capacity.



Philco upright freezer model AV 75 is a 7½ cu. ft. model with three compartments. One is for sharp freezing. A 10 cu. ft. model AV 100 is also made in this design.

Philco Freezers

To serve the fast growing market for frozen foods storage facilities, Philco introduced four freezers. The smallest of these is a 2½ cubic foot freezer that reaches 25 degrees below zero. A unique feature of this unit, as well as all other Philco freezers, is a warning bell which rings automatically in the event of a blown fuze or electric power stoppage. Other Philco freezers have a capacity of 5 cubic feet, 7½ cubic feet and 10 cubic feet, the two largest sizes being upright models.

All new models are being shown to the company's 20,000 dealers at a series of regional meetings throughout the country, and will be on display at dealers' stores as soon as production is large enough to stock all dealers.

S S S

REMA officials reported the industry now is working at top speed to fill an estimated demand for home and farm frozen food units—variously estimated at anywhere from 1,000,000 to 8,000,000—and for new refrigerators with frozen food compartments. Production also is being pushed on refrigerated display cases, refrigerated transportation equipment and other products needed for food freezing.

MORE GAUGE QUALITY —PLUS

Of course the first and foremost requirement of a pressure gauge is accuracy. But almost any gauge starts off accurate. The real measure of gauge quality is found in ability to stand up and *stay accurate.*

Marsh Gauges do. The Marsh reputation for making instruments of lasting accuracy is traditional. You would need no better reason for insisting on Marsh Gauges for every application. But you have still another reason—the Marsh "Recalibrator".

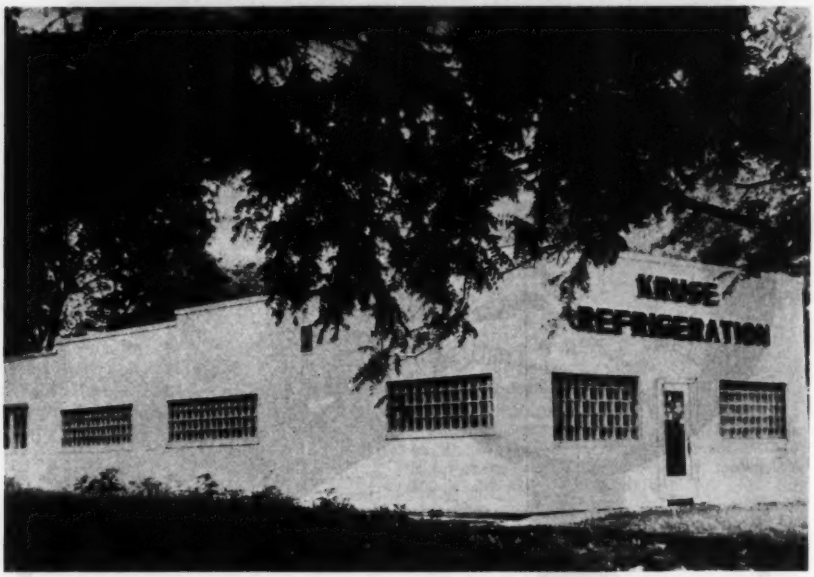
If some abnormal condition knocks a Marsh Gauge out of adjustment a twist of the "Recalibrator" screw will restore its accuracy at *all points* on the dial—a feat that cannot be accomplished with certainty by the conventional zero adjustment.

You get lasting accuracy when you select the Marsh Gauge . . . and on top of that the "Recalibrator".

JAS. P. MARSH CORP., 2059 **Southport Avenue, Chicago 14, Illinois**
Export Department: 155 East 44th St., New York 17, N. Y.

MARSH
Refrigeration Instruments

Kruse Refrigeration Service Builds Modern Place Of Business



V. R. Kruse built this modern 26'x60' place of business to house his growing refrigeration sales and service operations. The building is located on Illinois State highway 120 on the outskirts of Woodstock, Ill.

ANOTHER example of how the independent refrigeration service engineer is growing up and establishing himself as an efficient highly respected representative of the refrigeration industry in his community, is the Kruse Refrigeration Company of Woodstock, Illinois.

V. R. Kruse, owner of the Company, has been in business for a number of years, getting along as best he could with a "makeshift" place of business. He had definite ideas of what kind of business place he wanted, however, and he had the money and courage to carry his ideas through to a successful conclusion. By so doing, he has not only gained prestige in his field of endeavor, but he is now able to provide better service and better workmanship for his customers.

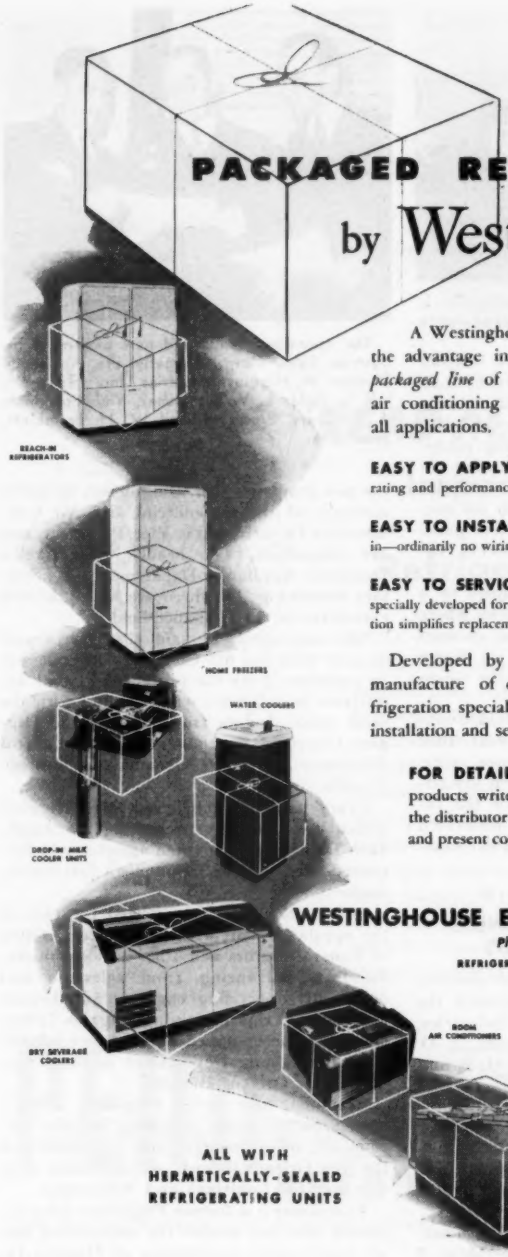
Converting his ideas to actions, Mr. Kruse built and occupied last year, the modern 26' by 60' one story building pictured here. It occupies a lot next to his home on Illinois State Highway 120, on the outskirts of Woodstock, Ill. Construction is of Hidit, an insulating building block, finished on the outside in white stucco. Windows are glass brick and fluorescent lighting is used.

Mr. Kruse equipped his repair shop with modern lighting, power tools and conveniences, enabling him to provide better workmanship for his customers.

The front part of the building is devoted to an office and display room 16' by 26'. Tiled floors, white walls, one piece panel birchwood doors and hardwood trim, lend a smart businesslike appearance to the room.

A 16' by 32' work shop running along one side of the building is well equipped with modern power tools and conveniences.

PACKAGED REFRIGERATION
by Westinghouse



A Westinghouse commercial franchise gives you the advantage in today's big market . . . *a complete packaged line* of commercial refrigeration and room air conditioning products, in sizes and models for all applications.

EASY TO APPLY—Complete factory-prepared application data, rating and performance tables provided to simplify the dealer's job.

EASY TO INSTALL—Complete *packaged* units ready to plug in—ordinarily no wiring or assembling necessary.

EASY TO SERVICE—Complete and detailed factory instructions specially developed for dealer servicing—hermetically-sealed construction simplifies replacement when necessary.

Developed by Westinghouse . . . pioneer in the manufacture of complete packaged commercial refrigeration specialties . . . engineered to simplify sales, installation and service.

FOR DETAILS about the availability of these products write to Westinghouse. We will have the distributor *in your territory* call directly on you and present complete franchise information.

WESTINGHOUSE ELECTRIC CORPORATION

Plants In 25 Cities . . . Offices Everywhere

REFRIGERATION SPECIALTIES DEPT. • SPRINGFIELD, MASS.

ALL WITH HERMETICALLY-SEALED REFRIGERATING UNITS

The famous Westinghouse hermetically-sealed condensing unit is the heart of this Packaged Refrigeration Line.

The salesroom of the Kruse Refrigerator Co. is smartly finished and pleasing in appearance

Among them are two all steel work benches along one wall; a 36" x 48" x 30" dehydrating oven and evacuating pump electrically heated; a bench type drill press, bench lathe, arc welding and acetylene welding equipment. Outlets for testing units under repair are hung from the ceiling and compressed air outlets are provided in six convenient locations in the shop. A test panel containing all essential test instruments centralizes this work.

The rear of the building is occupied by a 16 by 26' receiving and cleaning room where units are unloaded, checked and cleaned before being taken into the shop. A Kleen Flow parts washer takes care of the cleaning of parts.

The balance of the building is divided into a 10' by 12' stockroom, a clean neat little washroom and a 10' by 10' furnace room. Oil heat is used with filtered forced air circulation. Provisions are made for the future addition of air conditioning connected to the same duct system now used for heating.

S S S

HIGGINS PRESENTS BUSINESS TO OPERATING HEADS

IN AN unusual business world gesture, Andrew J. Higgins has presented the Appliance Division of Higgins Industries, Inc., to its present operating heads, J. O. Crary, L. V. Busenlener, and W. H. Bramblett.

Announcement was made today that the Industries Sales Corp., has been organized and is operating without interruption as distributors of the lines of commercial and domestic products formerly handled by the Appliance Division.

Mr. Crary, who served as Division Manager under the Higgins name, is President of

The operating heads and new owners of Industries Sales Corp., formerly the Appliance Division of Higgins Industries, Inc. They are left to right: L. V. Busenlener, Vice President; J. O. Crary, President, and W. H. Bramblett, Sec.-Treas.

the new company. Mr. Busenlener, formerly manager of the Commercial and Air Conditioning Department, is Vice-President, and Mr. Bramblett, who headed the Higgins Domestic Appliance Department, is secretary-treasurer. All three are widely known executives in the appliance field.

The announcement said that offices and display rooms at 521 City Park Avenue will be maintained for the present, and that Industries Sales Corp., will continue with the same retail dealers franchised by the Higgins Company in Louisiana, South-Central Mississippi, Southern Alabama and Western Florida.

Crary said, "He believed Mr. Higgins' action in voluntarily presenting the Appliance Division to the three associates is 'unprecedented in the appliance distributing business.'"

Before the war, Crary served 15 years in the appliance field with Frigidaire Division of General Motors and other national manufacturers, advancing from salesman and dealer to supervising engineer and branch executive. Prior to joining Higgins Industries, Inc., he managed the Commercial and Air Conditioning Department in the Frigidaire New Orleans Branch.

Bramblett also served Frigidaire in various executive posts, including regional accountant, office manager and comptroller of the New Orleans Branch, and appliance sales manager for Louisiana and Mississippi.

Busenlener is a former Frigidaire sales engineer, who has headed the commercial and air conditioning department of Higgins In-

READ ALL ABOUT IT!

Important Facts for Refrigeration Men

• Get your copy now! This new Penn condensed Catalog has plenty of information that refrigeration men can use. It gives you all the facts on PENN Automatic Controls for Refrigeration and Air Conditioning in a concise, easy-to-use manner. There are 16 pages—complete with specifications, pictures and standard replacement parts. It's indexed, too, to save you time and effort. Send for your copy today. Write *Penn Electric Switch Co., Goshen, Ind.* Export Division: 13 E. 40th St., New York 16, U.S.A. In Canada: Penn Controls, Ltd., Toronto, Ontario.

•

PENN

AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, ENGINES, PUMPS AND AIR COMPRESSORS

dustries, Inc., for a number of years.

Although Higgins is best known for its war production record of building more than 20,000 combat craft, and many other war items, the company has for years served as a distributor for various appliance lines. About 12 months ago, the Appliance Division was reorganized and enlarged under Crary's direction, to expand its operations.

THREE-ZONE FARM REFRIGERATOR DESIGNED

A THREE-ZONE farm refrigerator designed to serve the frozen food needs of farmers who live in sparsely settled sections where a frozen food locker plant is not conveniently located, has been developed by F. D. Yung, research agricultural engineer at the University of Nebraska, College of Agriculture. The refrigerator is described by college officials as highly practical, and the cabinet can be built in sections locally and assembled on the farm or ranch. It also can be taken apart and reassembled, if necessary.

The three compartments for freezing, chilling and frozen storage occupy a space of 43½x84 inches, 84 inches high. The chilling compartment has 38 cubic feet of space so that a whole hog or two quarters of beef can be accommodated. A set of removable and adjustable shelves have been designed by Mr. Yung and these can be put into place and the compartment used for above-freezing storage in the chilling section when not being used otherwise. Floor space beneath the shelves readily accommodates four 10-gallon cream cans or two 30-dozen egg cases. A down-draft blower type evaporator is used for cooling.

The freezing compartment has approximately 12 cubic feet of space and is provided with an eight-inch fan for circulation of air. Temperature control range is from zero Fahrenheit to five degrees below zero. Refrigeration of the compartment is by three 28x28-inch plates which have been designed to be used as shelves and for plate freezing. Temperature is regulated by means of a thermo-expansion valve and a low pressure control on the compressor.

Location of the 24 cubic foot frozen storage space is just below the freezing compartment and is maintained at approximately zero. Plates are the same size as those in the freezing compartment, while adjustable shelves also are provided for convenience in storing packaged frozen foods. Temperature control is the same as that of the freezing compartment.

Four-inch fir flooring is used for covering both the exterior and interior of the refrigerator. Insulation is provided by approximately seven and a half inches of shredded redwood bark on the outside walls of the below-freezing compartments, while the chilling compartment and doors have five and one-half to six inches of the same insulation.

The compressor is driven by a one-horsepower electric motor, water cooled. It has been found to furnish an ample margin of power when operated at normal speed. Mr. Yung said a three-quarters horsepower air-cooled refrigerating machine should be ample for ordinary operating conditions. Electrical energy consumption in the laboratory where the unit is being tested has amounted to an average of 250 kilowatt hours per month.

"On the farm, operating cost would depend on the location of the unit and the amount of use," Mr. Yung pointed out. He estimated that the refrigerator should use only 250 to 300 kilowatt hours monthly during the summer months. Winter consumption would be much less, naturally.

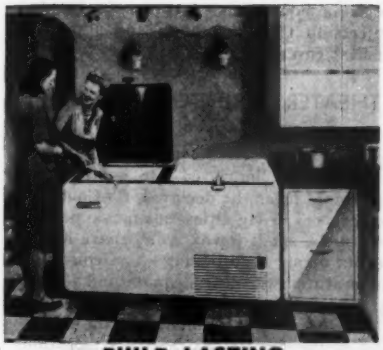
Cost of the materials for the refrigerator is estimated by Mr. Yung at $715. This excludes labor but includes cabinet, plates, down-draft evaporator, refrigerating machine, controls, tubing and fittings.

LEADING SCHOOLS EXPERIMENTING WITH FROZEN FOODS

THE American consumer, his appetite whetted by the restrictions of a wartime diet, soon will enjoy the tastiest and healthiest food of his life due to experiments now in progress or planned in the nation's leading schools and universities, the Refrigeration Equipment Manufacturers Association predicted today.

The prediction is based on the results of a servey just completed among 100 leading schools and state universities to determine the extent of their activities in the field of frozen foods. More than 50 per cent of the schools covered are either conducting frozen food experiments or planning such experiments.

Most of the experiments are directed toward retaining the fresh flavor of fruits, vegetables, meats and dairy products without losing the vitamin content and nutritive value of the food.



BUILD LASTING CUSTOMER GOODWILL WITH THE QUALITY-BUILT BEN-HUR *"Farm and Home" Freezers*

"QUALITY is remembered long after PRICE is forgotten" is a truth that applies particularly to freezers for the farm and home. Today, with a great and widespread public interest in home freezing units, it is highly important for distributors and dealers to choose a line that insures these ESSENTIAL FEATURES:

Write for full particulars TODAY.

★ **Construction that is Sound** and Durable, with long-lasting, properly builtin insulation.

★ **Laboratory Tested,** under all conceivable operating conditions.

★ **Design that is Practical** — efficiently planned for conveniently accessible storage.

★ **Engineered** and Perfected by Leading Refrigeration Experts — to assure continuously dependable operation.

★ **Complete Size Range** — Meeting All Family Needs — City or Country.

BEN-HUR MFG. COMPANY
634 East Keefe Ave., Milwaukee 12, Wis.

BEN-HUR FARM & HOME FREEZERS

MOTOR-START *Capacitors*

• Count on Aerovox for your motor-starting needs—and you won't go wrong! In the first place, Aerovox pioneered the high-capacity electrolytics for motor-starting purposes. Millions of those capacitors are in daily use. Their service records tell the story of Aerovox dependability.

Furthermore, the Aerovox post-war line of motor-starting capacitors includes both exact-duplicate and universal types of electrolytics and oil capacitors. You get precisely what you need for a first-class repair job.

• See Our Jobber • • •

Ask him for Aerovox motor-starting capacitors. He either has them or can get them for you. Ask for our latest catalog. Or write us direct.

AEROVOX capacitors
FOR RADIO-ELECTRONIC AND INDUSTRIAL APPLICATIONS

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At the University of California, a group of scientists are diligently seeking the proper method for freezing fruit juices during peak fruit production periods.

Eggs, a necessity in any well-balanced diet, occasionally become almost luxury items in the family budget during the low production periods, but the University of Wyoming is seeking a remedy for this.

The Wyoming experts are investigating frozen eggs which will not lose their taste, appearance or nutritive qualities. Biggest problem they face is the elimination of the gumminess in yolks of eggs held in storage.

Rhode Island State College is conducting experiments on freezing method for retaining all the vitamins contained in fresh fruits and vegetables.

Community food preservation problems are the subject of mechanical refrigeration research at the University of Georgia. The university also reported to REMA that it is experimenting with various freeze methods for preserving milk, butter and eggs.

The Illinois Institute of Technology is devoting considerable time to a project involving the destruction of bacterial infection on eggs by freezing processes.

Freeze methods of preserving citrus fruits is the principle objective of complicated frozen food experiments currently engaging the attention of scientists at the University of Florida.

Freezing Entire Meal

Texas Technological College is planning experiments in freezing entire meals and combinations of foods to enable the housewife to prepare well balanced menus far in advance.

Shrimp and other seafoods will be available the year around, with all the flavor of the fresh-caught product, in all sections of the country if experiments in freezing processes now in progress at Louisiana State University are successful.

More and better steaks, chops, roasts and poultry will grace the American table as the result of experiments in mechanical refrigeration now in progress at the University of Illinois, University of Missouri and several other schools.

The same survey shows that the nation's leading educational institutions plan extensive expansion in their courses in mechanical refrigeration and air conditioning to meet the growing demand for advanced instruction in these fields.

The survey indicates a 25 per cent increase in educational facilities in the two subjects in the 100 schools and state universities covered.

S S S

THEATERS ARE GOOD MARKET

(Continued from page 53)

tors in creating a trend toward a more universal use of improved air conditioning. This would mean, he declared, that not only theatergoers in big cities, but movie patrons even in the small towns, would have all the benefits of air conditioning—well controlled temperatures with an adequate and healthy distribution of clean air.

Mr. Rapp cited a number of the advantages of the modern improved air conditioning equipment which is designed as part of the theater building. Not only are they decorative and conspicuous, he said, but the new systems allow for better distribution of air, the elimination of drafts and more accurate control. The cost of installation is higher than that of the make-shift systems, but more comfort and economy of operation are provided and the rules of the health code are more adequately fulfilled.

Included in modern air conditioning are filters that clean the air of dust and dirt particles and sterile lamps that purify through killing any germs in the air. The zone control system used allows the temperature in one small area of the building to be regulated without changing the temperatures throughout the theater.

S S S

HERMAN GOLDBERG'S ANNUAL CHRISTMAS PARTY

MORE than 1,600 were in attendance at Herman Goldberg's annual Christmas party held in the Drake Hotel, Chicago, Dec. 13. As usual the party proved the highlight in social activity for the season. See views of party on page 66.

Over 40 waiters employed for the occasion were kept busy serving the refreshments provided by Mr. Goldberg, to the thirsty crowd. Several acts of entertainment and dancing were the main features of the evening.

Visitors came from all parts of the middle west filling the Grand Ballroom and overflowing the surrounding corridors and anti-rooms. Numerous prizes, some of which were war bonds, were given to the lucky holders of the right numbers. At 2:00 a.m. many were still reluctant to terminate their most enjoyable evening of the year.

6 valves in 1

GENERAL CONTROLS'

Thermal Expansion REFRIGERANT VALVE

- **Thoroughly field-tested** for Freon, Methyl Chloride and Sulphur Dioxide.
- **Easily-removed** orifice cartridges eliminate need for stocking several sizes for low tonnage installations.
- **Ample** diaphragm plus balanced, low-rate adjusting spring.
- **Carefully-lapped** hard-faced ball insures tight shut-off.
- **Frictionless** pusher pin.
- **Semi-liquid charged;** may be placed in ambient temperatures higher or lower than bulb temperatures with no loss of control.
- **Unmatched** sensitivity.

For complete specifications on the V-200 and other refrigerant controls in the broad GENERAL CONTROLS line, write for your copy of Catalog 52B. Send request to your nearest GENERAL CONTROLS branch, distributor or refrigeration supply house.

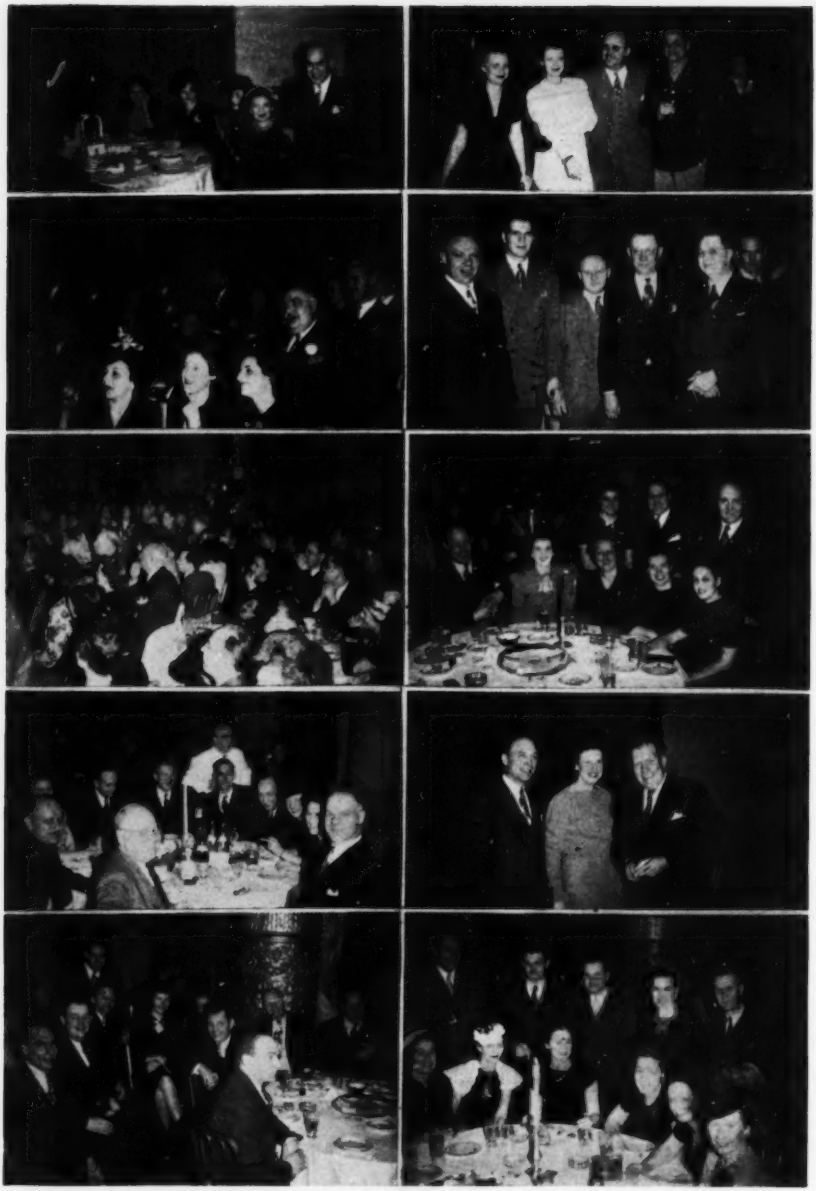
Interchangeable **Orifice Cartridges**

Permit Proper Sizing *on the job!*

CARTRIDGE NUMBER	CAPACITY IN B.T.U. PER HOUR		
	FREON	METHYL CH.	SULPH. DI.
1	750	1700	1710
2	1500	3400	3420
3	3000	6800	6840
4	6000	13600	13700
5	9000	20400	20500
V-200 VALVE WITH NO CARTRIDGE	12000	27204	27400

GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIF.

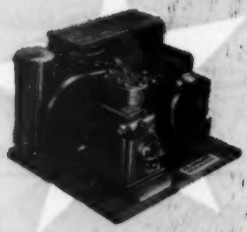
FACTORY BRANCHES: ATLANTA • BOSTON • CHICAGO • KANSAS CITY • DALLAS • DENVER • DETROIT • PHILADELPHIA • NEW YORK
5-1 CLEVELAND • SAN FRANCISCO • HOUSTON • SEATTLE • PITTSBURGH • *DISTRIBUTORS IN PRINCIPAL CITIES*



Views of Herman Goldberg's Annual Christmas Party held Dec. 13 at the Drake Hotel, Chicago. The host, standing, and his wife, seated next to him, are pictured in the upper left hand corner. Over 1600 were in attendance.

Photos by Irving Alter

KELVINATOR CONDENSING UNITS



NOW

Competitively Priced

AND

Conveniently Warehoused

50 DEPOTS CARRY COMPLETE PARTS STOCKS
Kelvinator's warehousing system is convenient to *everyone!* And these 50 distributor and branch points stock Kelvinator Condensing Units and parts, as well as a full line of refrigeration supplies.

Production of Kelvinator Condensing Units is now confined to a streamlined group of models covering the needs of most commercial condensing unit buyers. With Kelvinator's greatly expanded facilities and new war-born production methods, this has made possible an entirely new sales-minded policy for merchandising Kelvinator Condensing Units . . . available now—and *competitively priced.*

NASH-KELVINATOR CORPORATION
Detroit

BUY KELVINATOR FOR YOUR COMMERCIAL REFRIGERATION REQUIREMENTS

Kelvinator **CONDENSING UNITS** OPEN AND SEALED

Refrigeration Service Engineers Society

Official Announcements of the activities of the International Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

INTERNATIONAL HEADQUARTERS: 433-435 North Waller Ave., CHICAGO 44, ILL.

COMING CONVENTIONS

RSES Convention

Place: Hollenden Hotel.
City: Cleveland, Ohio.
Date: October 26, 27, 28, 1946.
Secretary: H. T. McDermott, 433 N. Waller Ave., Chicago 44, Ill.

REMA Meetings and Convention

Spring meeting: March 4-5-6-7, 1946.
Place: Stevens Hotel, Chicago, Ill.
Joint meeting with jobbers.

All Industry Exhibition:

Place: Cleveland Public Auditorium.
City: Cleveland, Ohio.
Date: October 28-29-30-31, 1946.
Exec. Secretary: R. Kennedy Hanson, 1107 Clark Bldg., Pittsburgh, Pa.

REWA Meeting

Date: March 4-5-6, 1946.
City: Chicago, Ill.
Exec. Secretary: H. S. McCloud, 920 E. McMillan St., Cincinnati 6, Ohio.

ASHVE 52nd Annual Meeting

Place: The Commodore.
City: New York, N. Y.
Date: January 28-30.
Secretary: A. V. Hutchinson, 51 Madison Ave., New York 10, N. Y.

WISCONSIN STATE CONVENTION PLANNED

THE State Board of Directors of the Wisconsin Association of R.S.E.S. met in Madison on the 27 and 28 of October. At the dinner meeting, Saturday evening, many matters pertaining to the welfare of the association were discussed.

The business session, on Sunday, was called to order by Temporary President Lee Miles. The Apprentice Training Programs of the State Association as well as that of the National Training Committee were discussed and recommendations making them more applicable to our own conditions, were made.

The Board decided to accept the recommendations made at the formation meeting that the first annual convention be held at Madison in March. Temporary officers will serve until the convention.

State Code & License Laws were discussed and the secretary was instructed to have proposed code and licensing law drawn up. If every refrigeration engineer in the state could see the necessity, it would simplify getting such safety legislation passed.

SUNSHINE CITY CHAPTER, ST. PETERSBURG, FLORIDA RECEIVES CHARTER

AT A special meeting called for the occasion and preceded by an excellent dinner at the Employees Clubhouse of the Florida Power Company on the Gulf of Mexico, Sunshine City Chapter, St. Petersburg, received its Charter on November 28.

Practically all of the members were in attendance and President J. H. Harris received the Charter on behalf of the Chapter from International Secretary H. T. McDermott. Sunshine City Chapter is an active organization of the representative service men in Pinellas County and the officers are: President, J. H. Harris; Secretary, R. B. Schroeder; Treasurer; R. V. Money. The charter members are: R. T. Duke, Barney Gaylard, J. E. Kirkland, N. L. McCauley, St. Clair Petty, Charles E. Roland, Ralph C. Salter, James B. Sanders, James I. Sanders, Paul D. Shaw, Charles V. Sproul, F. G. Von Leue, T. A. Wikstedt.

REFRIGERATOR COIL CLEANER

Removes Water Scale
From
Condenser Coils
Unit Coolers • Spray Heads
Compressor Jackets
Refrigerator Drains
Water Fountain Coils
Sulphured Compressors
Valve Plates

FACTORY SALES CO-OPERATION

Write for Literature or Refer to Your Local Jobber

SKASOL CORPORATION

WEBSTER GROVES 19, MISSOURI

ALABAMA STATE MEETING DRAWS LARGE THRONG

View of the dinner dance at which the Birmingham chapter acted as hosts to the Alabama state meeting

ORIGINALLY scheduled to meet in Montgomery, Alabama, as in 1944 the 1945 Alabama State R.S.E.S. meeting was changed to Birmingham because of the lack of hotel facilities in Montgomery. Birmingham Chapter accepted the responsibility and acted as hosts for an educational conference that proved an informative and live convention. The meeting was held in the Tutwiler Hotel November 19 and 20th.

Although Birmingham Chapter was only chartered April 2, 1945, the convention program and arrangements indicated the experience of a veteran organization in the efficient manner in which the meeting was conducted.

A 32-page advertising program carried the announcements of district representatives and refrigeration manufacturers in the southern territory. Over 250 members and guests registered, representing fourteen states.

The Monday morning session was set aside as "open house" at the various Birmingham wholesale parts companies, refrigeration equipment distributors, service organizations and schools.

Opening the afternoon session, Rev. John Elliott, pastor Wylan Presbyterian Church, pronounced the invocation. Members and guests were welcomed by Hon. Cooper Green, mayor of Birmingham, whose remarks indicated a thorough familiarity with the refrigeration service business and expressed his appreciation on behalf of the city for the fine work that refrigeration companies had done in maintaining the public welfare. He expressed a most encouraging future for the men engaged in the business in the South.

J. M. Manley, president of Montgomery Chapter, responded to the mayor's remarks and delivered an excellent message on the value of association work.

L. C. McKesson, sales manager, Ansul Chemical Company, Marinette, Wis., in starting the educational program, discussed the results secured in the Ansul Laboratories on the study of the formation of wax in lubricating oils at low temperatures. Pictures accompanying his talk graphically illustrated results secured.

The refrigeration equipment manufacturers and their representatives acted as hosts at the evening dinner with E. V. Dunbar, Atlanta, Ga., as master of ceremonies. Each manufacturer or his representative present was introduced. Following the dinner, H. T. McDermott, International Secretary, addressed the meeting on "The R.S.E.S. Looks Forward." Concluding the evening meeting, Harry Dawson, district representative, Kerotest Manufacturing Company, Pittsburgh, under the subject "It's Going to be Different" briefly described several new products his company was developing.

HERVEEN the Replacement Refrigerant

Servicemen—Herveen is the IDEAL REPLACEMENT GAS for Meter-Misers. When your Frigidaire Meter-Miser customers need service on their unit, don't turn them down with the statement "the refrigerant is not available." We can deliver

HERVEEN the IDEAL

REPLACEMENT REFRIGERANT

Many service companies are using this refrigerant for charging Meter-Misers in their localities.

★ Meter-Miser calls become routine if you have a supply of HERVEEN.

★ Installing HERVEEN does not involve more than average care.

MODERN GAS CO., Inc. Manufacturers & Refiners
1084 Bedford Ave., BROOKLYN 5, NEW YORK

The Service Man's Ally against Moisture

ANSUL ICE-X

TRADE MARK REG. U.S. PAT. OFF.

ICE-X quickly cures emergency freeze ups when ice forms at the expansion valve or capillary tube. Harmless to use. Great for Freon, Carrene, or Methyl Chloride systems ...The dependable liquid anti-freeze.

ORDER FROM YOUR JOBBER OR—

EXCLUSIVE NATIONAL DISTRIBUTOR
THE HARRY ALTER CO. 1728 S. MICHIGAN AVE. CHICAGO 16, ILLINOIS

JOBBERS: WRITE FOR SPECIAL PROPOSITION!

Tuesday Session

R. W. Hall, Texas Oil Company, Houston, emphasized the importance of the proper oil selection for refrigeration under the subject "Lubrication."

An illustrated talk on "Thermal Expansion Valves" by Al Topp, Automatic Products Company, Milwaukee, Wisconsin, showed among other things the precision engineering and testing methods employed in production methods.

John M. Hubbard, Dayton Rubber Company, Dayton, Ohio, pointed out that service companies were in a position to secure good business by going after industrial belt and drive business. He said that such work was not difficult to figure and in his talk provided some factual engineering data contained in their company's bulletins.

The Tuesday luncheon was sponsored by the Alabama Jobbers and E. V. Dunbar as chairman introduced the hosts: R. Cooper, Harris Supply Company, Mobile, Ala; D. M. McInnis, Nolin-McInnis, Inc., Montgomery; Mrs. Robert Gennett, Refrigeration Supply Distributors, Birmingham and M. Banton, Auto Service Company, Birmingham.

"The Defrosting Cycle" by G. E. Graff, sales manager, Ranco, Inc., Columbus, Ohio, proved as usual that this well known speaker in service circles had much information to provide an attentive audience. In addition to his selected subject, he gave a preview of the new two temperature domestic refrigerators and related some interesting facts in regard to possible service complaints.

Concluding the educational program, H. Goldberg, president, Chicago Seal Company, Chicago, Ill., outlined the construction and operation of the standard Chicago Seal as well as other special models for various applications.

Birmingham Chapter acted as hosts at a cocktail hour followed by the annual dinner-dance and prizes were presented to a number of the ladies and members in attendance by E. V. Dunbar, who acted as toastmaster.

Committees and officers responsible for the planning of the convention, included E. V. Oakwood as program chairman, and Mr. G. D. Maske as chairman of registration. The officers of the Chapter are: President, W. C. Kent; Vice-President, Floyd Corbin; Secretary, Wiley E. Stuart; Treasurer, W. E. Hereford.

MIAMI CHAPTER HAS COLORFUL CHARTER NIGHT

CHARTER Presentation Night, November 26, was a "not-to-be-forgotten" event in the young life of Greater Miami Chapter. Lilley's Restaurant, one of Miami's famous night spots was reserved for the occasion and 200 members, ladies and guests enjoyed the dinner, entertainment and dancing provided by the chapter.

An attractive printed program, a memento of the occasion, contained the announcements of manufacturers, dealers, jobbers and service organizations.

J. R. Turpin, Jr., acted as master of ceremonies in introducing the various celebrities, including Mayor Frink of Miami Beach and Dan Rosenfelder, Public Safety Director of

MIAMI CHAPTER CHARTER PRESENTATION

Reading from left to right are: J. R. Turpin, Chairman of Arrangements; Mrs. J. R. Turpin; Mayor Frink, Miami Beach, Fla.; H. T. McDermott; J. D. Nall, President, Miami Chapter; Dan Rosenfelder, Public Safety Director, Miami, Fla.; Mrs. Dan Rosenfelder; and Mrs. J. D. Nall.

OFFICERS OF THE NEW CHAPTER

Reading from left to right are: Al Plaag, Secretary; A. L. Bizzell, Treasurer; W. T. Pike, Assistant Secretary; J. D. Nall, President; W. W. Kelley, Sergeant-at-Arms; H. T. McDermott; R. S. Smith, Vice-President; J. H. Colvin, Second Vice-President.

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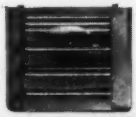

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Miami. Following the banquet, the charter was presented to Mr. J. D. Nall, president of Miami Chapter by International Secretary H. T. McDermott.

The officers of Miami Chapter are: President, James D. Nall; 1st Vice President, R. A. Justin; 2nd Vice President, J. H. Colvin; Secretary-Treasurer, Albert F. Plaag; Sergeant-at-Arms, W W. Kelley.

CHARTER MEMBERS

C. F. Andrews
J. H. Ballentine
R. W. Beller
A. L. Bizzell
K. R. Brand
H. A. Brautigam
David Brooks
George Brophy
O. W. Brown
J. W. Burnside
E. T. Buyama
J. A. Callaway
J. M. Chauncey
Walter W. Coe
Henry Cohn
J. H. Colvin
T. E. Corwin
Oren Crouch
G. A. David
Al DeBoeser
B. E. Edwards
H. V. Flood
N. R. Ganger
L. P. Gignac
J. C. Graves
C. R. Gray
J. E. Griffin
G. F. Harnishfeger
J. J. Harris
H. L. Hart
W. J. Hayes
Wm. R. Henry
H. C. Higgins
C. E. Hogan
R. B. Hoiemeyer
E. H. Jackson
R. A. Justin
W. W. Kelley
A. H. Kent
T. R. Kuhn
F. F. Leach
Aaron Lee
A. Linares
H. E. Luck
James Maguire
J. C. Mahlbacher
V. F. Marakis
W. F. Matheson
J. D. Maus
J. L. McCarthy
J. Emmitt McGraw
H. J. Mendenhall
W. M. Miller
M. P. Mincher
B. I. Mobley
D. P. Murray
E. J. Musgrove
James D. Nall
F. L. Nieva
R. E. Nitzsche
J. N. Paddock
Emil Page
A. H. Palmer
M. D. Patterson
H. A. Peresett
F. F. Pierce
F. S. Pierce
W. T. Pike
A. F. Plaag
H. C. Rahn
H. E. Rickels
P. E. Ritchie
C. M. Roberts
E. A. Runyon
Warren J. Schafer
J. E. Scott
G. F. Senke
C. H. Sipple
C. H. Smith
R. D. Smith
R. S. Smith
D. L. Snyder
V. G. Steedman
C. E. Stout
C. U. Sturgis
K. R. Sundman
Wm. Tank
J. R. Thompson
W. C. Thorn
P. R. Turner
J. R. Turpin, Jr.
G. C. Vaught
E. O. Verbine
C. G. Wilson
John H. Zons

HUSSMANN-LIGONIER TO FEATURE ST. LOUIS CHAPTER MEETING

AT A meeting of the St. Louis Chapter to be held Tuesday, January 15, at Alhambro Grotto, Hussmann Distributing Co. will present the latest development in a low temperature, open type self service frozen food display case manufactured by Hussmann-Ligonier Co. The display in operation will be the first group showing of this refrigerated fixture.

Representatives of the company will explain the construction and operation of the equipment providing an interesting and educational feature for the evening. Every refrigeration man in the area, whether he is a member or not is invited to attend.

Refreshments will be served following the meeting. San Wolff, Secretary of the Chapter in cooperation with the Hussmann-Ligonier Co. is making every effort to provide a pleasant and successful evening for the large attendance expected.

Hussmann Engineers have developed an Open Self-Service Frozen Food Display Refrigerator which will be demonstrated at the St. Louis chapter meeting. Frozen foods by means of this unit can be displayed within clear view and easy reach of customers. Hussmann states this to be the first development of an open frozen food display case to successfully display merchandise so that it may be seen through a glass front from any part of the store. Mirrors are not used to show the merchandise but merely to add mass and sales appeal to the display. The products can be reached without moving slide doors or lift type doors or reaching down into the refrigerator for merchandise as must be done with many types in use.

R.S.E.S. Chapter Notes

ROCKFORD CHAPTER

Rockford, Ill., Dec. 17—Educational Chairman L. L. Sturch reported an interesting program completely arranged for the coming year. The stag committee reported a profit on the smoker held recently and announcement was made that a luncheon would be held at the next meeting.

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NOVA SCOTIA CHAPTER

Halifax, N. S., Dec. 5—Bad weather prevented many from attending this—the first meeting of the season. Among the discussions held was one on Licensing and Certification of service men. Most of the members were in favor of Certificates and the secretary was asked to investigate further. A special meeting is being called to make arrangements for the annual meeting and election of officers sometime in January.

MONTEREY COUNTY CHAPTER

Carmel, Calif., Dec. 12—During the business session a letter was read from W. W. Allison inviting the chapter to participate in the formation of a State Association. Delegates were selected to attend the formation meeting complying with Mr. Allison's request.

After some discussion the members agreed to carry ½ page of advertising in the telephone directory under the Society's insignia. To be included in the ad is a code of ethics and a listing of the member companies. Mr. Sonin, Educational Director, reported on results of a future educational program. Among those who are promised to date are Pete Howard of Mueller Brass Company to appear at the next meeting, and Frigidaire Corp. who will have a speaker on hand late in February or early in March. A discussion on the standardization of service rates was deferred until the next meeting.

BEEHIVE CHAPTER

Brigham, Utah, Nov. 29—Paul Hupp reported on the progress made in drawing up a code for the city. A committee was then appointed to complete the code and present it for consideration at the next meeting. Mr. Walker discussed common troubles in refrigeration service during the educational period, and Bill Snyder of Alco Valve Company took up the discussion carrying it on further. The question of a date for the charter presentation was deferred until the next meeting, but it is expected the presentation will be made in January.

CORN BELT CHAPTER

Bloomington, Ill., Dec. 12—One of the first discussions of the evening concerned the licensing of refrigeration service men, and the question arose whether the membership would be interested in another Certificate of Proficiency examination. A motion was passed to the effect that the secretary's dues be payed by the chapter in recognition of the work he does. The annual election of officers took the balance of the evening. The results were: Joe Woodard, *President;* Gordon Eubanks, *Vice-president;* Roy Hunter, *Secretary;* Ralph Porter, *Treasurer;* Ralph Penn, *Sergeant-at-Arms;* and M. V. Stagg, *Chairman of the Educational Committee.* The following men were elected to the Board of Directors: Harold Mason, Martin Clem, Raymond Patterson, Albert Bailey, and Alva E. Pantlen.

TOLEDO CHAPTER

Toledo, Ohio, Dec. 12—This was the date of the chapter's Christmas party held in Frank's Hall. Round and square dancing and the exchange of gifts provided much merriment for the evening. A short business meeting was held before the party and Fred Rudolph was present with his chef's suit. The annual election of officers resulted in the following: John Murphy, *President;* Leo Davison, *Vice President;* William Foster, *Secretary and Treasurer;* and John Horwath, *Sergeant-at-Arms.* Board of Directors elected are: Fred Ensman, Warren Mahon, and Clyde Getty.

FAIRFIELD COUNTY CHAPTER

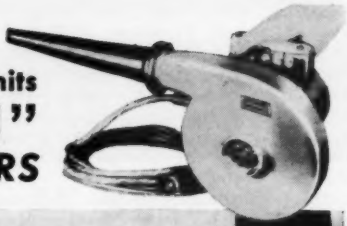
Stamford, Conn., Dec. 10—The election of officers occupied the greater part of the evening. The results were as follows: Bernard M. Packtor, *President;* Richard Chase, *First Vice President;* Earl Wilcox, *Second Vice President;* William I. Hoyt, *Secretary;* Earl Walters, *Treasurer* and Charles Savage, *Sergeant-at-Arms.* Ernest R. Schultz was elected Chairman of the Educational Committee. The following men were elected as the Board of Directors: Ralph Barker, Tom Dewey, Russel Thomas, and Edward Vogel.

New applications for membership received by the chapter included the following: Joseph C. Luich, Thomas I. Dewey, John Wargo, George E. Thomas, Walter Boyle, Jr., William E. Wagner, Daniel E. Robinson, John S. Hammond, Jr., Joseph E. Beaudoin, Charles L. Wagner, and Raymond J. Wagner.

MOUNT ROYAL CHAPTER

Montreal, Can., Dec. 17—A large attendance was present for the annual election of officers which resulted in the following: Gordon Roe, *President;* Ross Turner, *First Vice President;* C. E. Pigeon, *Second Vice President;* D. S. Greenberg, *Corresponding*

YOUR BEST BET



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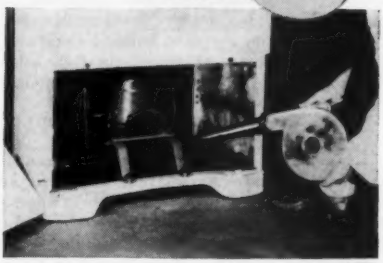

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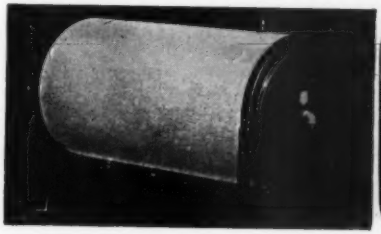

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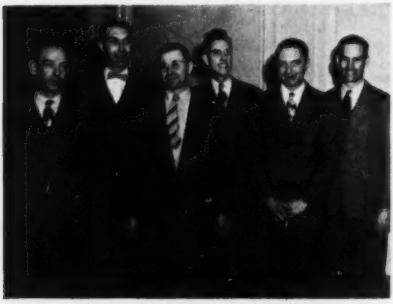
Secretary; Paul Forget, *Recording Secretary;* R. Brault, *Treasurer;* J. Davis, *Sergeant-at-Arms;* H. Milne, *Entertainment Chairman;* Guy Forget, *Educational Chairman;* and R. Ouimet, *Membership Chairman.* The Board of Directors elected are: C. A. Fabien, L. P. Tremblay, H. Milne, B. Lacerte, and R. McCullough. L. P. Tremblay was elected *Auditor.*

The educational program included a movie on "Bellows Seals" shown by Mr. McGurn, of Fulton Sylphon Bellows Company. Another movie on Thermostatic Expansion Valves was presented by the Canadian School of Refrigeration.

ILLINOIS STATE ASSOCIATION

Chicago, Ill., Dec. 13—The Board meeting of the State Association was held on this date at the Drake Hotel in Chicago. President William C. Metcalf presided and the matter of the 1946 convention city was one of the first orders of business. Two bids



Officers of the Illinois State Association left to right: Keith Ruyle, 1st Vice President; William Metcalf, President; John Sackey, 2nd Vice President; Robert Saunders, Secretary; Ralph Porter, Treasurer and Floyd Lilley, Sergeant-at-Arms.

were received—the first from Fred Stevens, President of the Chicago Chapter and the second from J. J. Kline representing the Springfield Chapter. An open discussion on the question was concluded with a vote resulting in Chicago being chosen the next convention city. The date of the next convention was left to the decision of the chapter in which it is to be held. It was recommended however that the date be moved ahead so that there will be no conflict with the All-Industry Show to be held in Cleveland on Oct. 29, 30, 31, and Nov. 1, 1946. It was recommended that a smaller hotel be selected for the convention site so that there would be less opportunity for the members to become separated as so often happens in the larger hotels.

LONG BEACH CHAPTER

Long Beach, Calif., Dec. 12—Educational Chairman G. Van Ginkle introduced John Ross of Handy and Harmon who in turn gave an interesting talk on the use of his company's products, Silfos and Easyflo. A report by L. K. Willis, chairman of the training program committee on the recommendations distributed by the National office was discussed. Mr. Gable of City College reported on his plans for night school for members of the chapter, and the committee was asked to carry on with their work. John Engle presented a talk on training given army men in refrigeration schools.

Delegates were appointed to the meeting in which the formation of a State Association will be considered. The matter of forming a Ladies Auxiliary was held over for further study.

KANSAS CITY CHAPTER

Kansas City, Mo., Dec. 5—The nominating committee presented their report which was accepted and the committee discharged. Discussion on the advisability of returning to two meetings a month resulted in the decision to continue with one meeting a month and an alternate business meeting a month.

The invitation of Liquid Carbonic Corporation to hold a special meeting April 18th was accepted and the secretary was instructed to notify the company to that effect. T. W. Thomas of Texaco Oil Company was speaker of the evening, and he gave a short resume of oil production history, then gave an interesting discussion on refrigeration oils. Considerable time was spent following Mr. Thomas's talk on questions and answers from the floor.

ATLANTA CHAPTER

Atlanta, Ga., Nov. 29—During the business session a letter from Liquid Carbonic Company was read inviting the chapter to hold a special meeting on January 30th to which all refrigeration men in the area would be invited to view a two-and-one-half hour movie and discussion on Liquid Carbonic products. The invitation was accepted by the chapter and a committee appointed to complete arrangements. A buffet lunch was served followed the meeting.

ST. LOUIS CHAPTER

St. Louis, Mo., Nov. 30—The meeting was called to order by our President, Adolph Braun, who introduced the speaker for the

Actual THERMOBANK Installation in Locker Storage Plant of 500 Locker Capacity. The contracting firm was the Refrigeration Corporation of America, 241 W. 64th Stree , New York, N. Y.

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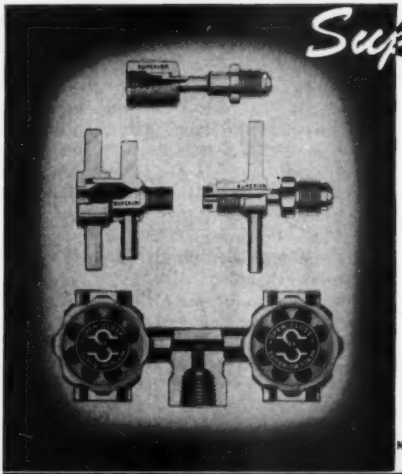

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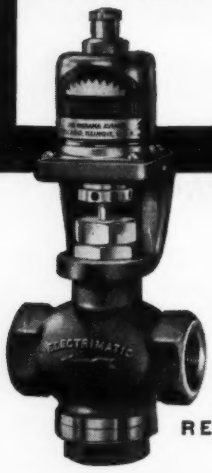

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evening, Mr. A. F. Sawyer of the Dole Refrigeration Co., Chicago, Ill. He began by giving chalk sketches of "Dole Vacuum Plates" and explaining the plate to tube contact which is a feature of their plates. He then showed colored projection slides on Factory construction of the Plates. This was followed by explanation and drawings on application of the Dole Plates to ice cream cabinets and soda fountains, refrigerated trucks, locker plants, etc. He closed with a question and answer period on application and service problems. As Mr. Sawyer had to catch a plane he did not stay for the remainder of the meeting.

Minutes of the previous meeting were read followed by a short discussion on places to hold future meetings. Otto Tinkey gave a brief picture of the film to be shown at the December meeting. John Spence of Hussmann-Ligonier Co., discussed the coming January meeting which is on the open self service frozen food cabinet.

The meeting was closed and refreshments were then served. Attendance was 27.

DECEMBER MEETING DRAWS LARGE ATTENDANCE

December—The meeting was called to order at 8:30 P.M. in the Victoria room of the Claridge Hotel. The meeting began by showing the film "Our Neighbors to the South," a travelogue in technicolor. Adolph Braun then introduced Paul Jett of the Minneapolis Honeywell Co., Minneapolis, Minnesota, who proceeded to give a brief outline of the history of the films their company had furnished for the program. They were "Basic Electricity" and "Basic Electronics" both in technicolor and were prepared for the Minneapolis Honeywell Co. by Walt Disney for training of Army Air Force Personnel. The film on the "Automatic Pilot" was not shown as it did not arrive as scheduled.

The minutes of the November meeting were then read followed by an announcement that after the meeting pamphlets would be handed out at the door, giving an outline of the events of the coming January meeting.

At this time, through the courtesy of the St. Louis Jobbers, seven Christmas wrapped attendance prizes were awarded. This was accomplished by putting the names of all the RSES members in a box and drawing them out one by one.

Although the weather was very bad we had a very nice turnout. Attendance was 60.

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1946—OUR TWENTIETH YEAR

A.S.R.E. HOLDS 41ST ANNUAL MEETING

DESPITE travel and hotel restrictions, a near record crowd of members and guests attended the 41st Annual Convention of the American Society of Refrigerating Engineers, December 10-12, at the Hotel Pennsylvania, New York City.

The following officers were elected to serve for the ensuing year: *President:* Charles S. Leopold, consulting engineer, Phila. *Vice Presidents:* Roland H. Money, The Reynolds Metals Co., Louisville, Ky., and Clifford F. Holske, Vilter Manufacturing Co., New York City. *Treasurer:* Professor Burgess H. Jennings, Northwestern Technological Institute, Evanston, Ill.

Directors: John G. Bergdoll, York Corp., York, Pa.; H. C. Diehl, The Refrigeration Research Foundation, Berkeley, Calif.; Dr. Richard C. Jordan, University of Minnesota, Minneapolis; Dr. Mary E. Pennington, consulting engineer, New York City; Arthur B. Schellenberg, formerly president of Alco Valve Company, St. Louis; E. K. Strahan, Sr., E. K. Strahan, Inc., New Orleans; William S. Woodside, United Cork Companies, Baltimore, Md.

A life membership was presented to Dr. A. W. Ewell, Director of Physics Department, Worcester Polytechnic Institute, and consulting engineer, Westinghouse Electric Corp., Bloomfield, N. J.

The Wolverine Award, offered by The Wolverine Tube Div., for the best paper published during the last year was made to D. D. Wile, Carrier Corporation, Syracuse, N. Y. The subject of his paper was "Psychrometry in the Frost Zone."

An award was also offered for the best paper presented during the year before one of the Society Sections. This award was made to M. B. Goddard, Carrier Corporation, Chicago, for his paper on "Moisture in Refrigerating Systems," presented before the Chicago Section of the A.S.R.E.

The guest speaker at the Annual Luncheon was Capt. Ellis M. Zacharias, Public Relations Division, U. S. Navy, who told of his conduct of the Psychological Warfare against the Japanese.

Among the papers discussed was "An Educational Guide to Refrigeration and Air Conditioning Training Facilities in the United States," a report of the Committee on Education, by Dr. Richard C. Jordan of the University of Minnesota. The committee surveyed the curricula of over 300 universities, colleges, vocational and trade schools in the country. The report is a summary of the refrigeration and air conditioning courses available in the schools of the United States. Tables show laboratory facilities, special courses planned for veterans, correspondence and extension courses, as well as the regular classroom courses.

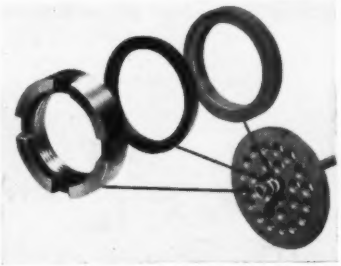
The selection, preparation and quality control of frozen foods of various types were among the technical subjects presented at the meeting. Among other subjects discussed were papers on thermal conductivity of insulating materials at low mean temperature, reduction of heat loads for industrial air conditioning, and a study of vibration isolation materials used in refrigerating equipment.

Newly elected officers of the A.S.R.E. shown in the upper picture from left to right are: Clifford F. Holske, Vice President; Prof. Burgess H. Jennings, Treasurer; Roland H. Money, Vice President; Charles S. Leopold, President.

In the center picture are: Prof. Burgess H. Jennings, Chairman Awards Committee and C. S. Leopold, President.

Lower picture: Dr. A. W. Ewell, Recipient of the Life Membership award and J. F. Stone, Retiring President.

ACME Ammonia Condensers



Lock-Nut Construction
—tubes easy to replace

Tubes can be quickly replaced right on the job with the tools you have with you. Simply take off the lock-nut, lead ring and rubber gasket (shown above) —slip out the old tube and put in a new one. Write for complete information.

ACME INDUSTRIES
Jackson, Michigan

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Cold Controls • Pressure Switches
One year guarantee on all repairs
Original Factory Specifications

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Detects leaks in refrigeration equipment before they cause damage to expensive installations and loss of costly products.

Years of use have proven *VISOLEAK* to be dependable, economical, safe and easy to use. See your refrigeration supply jobber or write for complete information.

finds hidden refrigerant leakage

WESTERN THERMAL EQUIPMENT CO.
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Dehydrators
Copper Sweat Fittings
Brass Flared Fittings
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Bundy Steel Tubing
Copper Tubing
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Tel. Randolph 6288

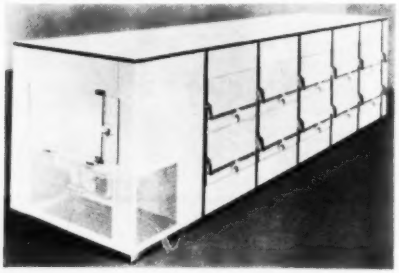
New and Improved Appliances

Addresses of Manufacturers represented in this department can be obtained from the Editor

Sectional Farm Freezer

HERE is a sectional unit quite similar to the conventional office filing cabinet, with pull-out drawers, the insulated front of which can be labeled or carded to show the exact items in each drawer. In this way different frozen foods can be segregated and you can find what you want instantly when you want it.

The frozen foods stored in the drawers of this unit need never be removed even while the unit is being defrosted. The drawers keep clear of all frost and can be opened or closed with a finger, thanks to their double roller bearing suspension.



ICEBERG FROZEN FOOD LOCKER

It's called the Iceberg Frozen Food Locker. It's completely self-contained, and fully insulated. Composed of individual sections 30 inches wide, 42 inches high and 46 inches deep, to permit their passage through a conventional sized doorway. The refrigerator section is a complete integral unit with condensing coil, blower and thermostatic control equipment of the same overall dimensions. Attached to this refrigerator section are one or more two-drawer sections (of 6 cu. ft. net capacity each drawer) and a narrow 6 inch insulated end section.

Suppose your requirements demanded 24 cu. ft. of storage space for 960 pounds. You would have your dealer install the refrigerator section and two two-drawer sections and the end section. A year later, if you needed another 12 cu. ft. of capacity, you could add the two-drawer section necessary, and have 36 cu. ft. capacity. You could continue to add sections up to 60 cu. ft. capacity, if you wished. All this without changing the refrigeration equipment at all.

With this unit, warm foods can be placed in any drawer to be frozen, without raising the temperature in any other drawer. If you want, the section nearest the refrigerator section can be equipped with wire baskets instead of file drawers, so you can do your own blast freezing as quickly as commercial plants do it. In this unit food odors are deposited on the coils and do not move from drawer to drawer. If the temperature rises to 5 degrees above zero, an alarm bell rings to warn you.

There also is available a large commercial unit, with 60 drawers, 360 cu. ft. capacity storing 14,400 pounds of meat for locker plants, stores, hotels, apartment houses or the like. These large units permit access for drawer renters in normal temperature rooms 24 hours a day, 365 days a year, with no attendant necessary.

"Midget" Safety Head

A "THROW-AWAY" pressure relief device for small air conditioning and refrigeration units. Price is so low that when over-pressure breaks the rupture disc you will generally find it cheaper to throw away the complete "Midget" and install a new one than to renew the rupture disc in a conventional type safety head.

Rupture disc installed, pressure tested and sealed at the factory. No gas leakage. No possibility of a service man putting in a rupture disc of wrong material or bursting pressure.

A NEW "THROW AWAY" TYPE PRESSURE RELIEF DEVICE

Connection sizes are, Inlet: ¼", ⅜", ½" Male NPT; Outlet: ⅜", ½" SAE flare, ½" Male NPT.

The safety heads are obtainable with rupture discs of Coated Aluminum at 150 to 500 lbs. bursting pressure or Silver at 250 to 500 lbs. bursting pressure.

PUT RUST TO WORK!

Brush or spray Nobs Glazecoat directly on rust. Rust aids in forming a permanent thermo-plastic coating that is not affected by water, alcohols, dilute acids, or alkalies. Prevents further rusting. Stands heat to 400° F. Covers about 300 sq. feet per gallon.

Price..... $3.50 per gal. F.O.B. Los Angeles

NOBS CHEMICAL COMPANY

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Seattle San Francisco

In Canada

Refrigeration Men are aware of these points

- **AIRCO'S** dependable replacement parts.
- **AIRCO'S** internationally known makes.
- **AIRCO'S** one day service policy on their needs.
- **AIRCO'S** efforts to help on refrigeration problems.
- **AIRCO'S** complete stock of belts — gaskets — seals — valves — refrigerants — etc.

AIRCO Refrigeration PARTS REG'D

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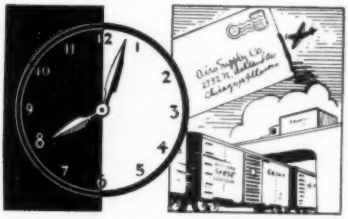
MONTREAL CANADA



AROUND THE CLOCK SERVICE While you sleep—while you are out on profitable service calls—while you take care of other important business matters—tools, equipment, and parts ordered from AIRO speed on their way to you. No valuable time wasted waiting for counter service when you buy by mail from AIRO, the middle west jobber geared up to give NATION-WIDE service "around the clock."

Time NOW to send for the 1946 AIRO Catalog

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THE ANSWER TO YOUR HELP PROBLEM

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Approved for G. I. training

Write us when you need skilled help

BOSTON TECHNICAL INSTITUTE, SCHOOL OF REFRIGERATION

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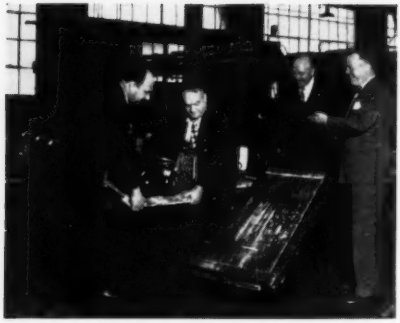

Sure this is a gag! They aren't quite far enough behind at Servel, Inc., Evansville, Indiana to have vice-presidents Harry Newcomb and W. E. Baker load units on a truck for Electric Division Sales Manager W. J. Aulsebrook to haul away, but it did take fast work on all their parts to get this first mass-produced Servel Supermetic off the production lines.

The man on the right is Geo. S. Jones, Jr., vice-president in charge of sales, who is turning this first condensing unit over to Aulsebrook to deliver.

ROBERT O. WHITE DECEASED

ROBERT O. WHITE passed away on December 15, 1945, at his home in Manhattan Beach, California, after a brief illness. He was born in Mitchell, South Dakota, on April 15, 1891. Attended Dakota Wesleyan University, graduating in 1912. Widow, Marie Dolan White, and three sons, Captain Robert O. White, Jr., U.S.A.A.C., James R. White, and William D. White, U.S.N.

R. O. WHITE

In August, 1929, he joined Day & Night Manufacturing Company, for the purpose of promoting sales of a new Water Cooler line —designed the current water and liquid cooling equipment manufactured by Day & Night and more recently, developed a line of evaporator plates and other commercial refrigeration items using the plate as a basic lowside.

He was a member of A.S.R.E. and the Board of Directors of R.E.M.A.

SCHNACKE, INC. PURCHASES SERVEL 10 TO 50 TON COMPRESSOR LINE

A NEWLY created Evansville, Indiana firm, Schnacke, Inc., has purchased from Servel, Inc., of Evansville the designs, models, patterns and right to manufacture and sell 10 to 50 ton electric refrigeration and air conditioning compressor units, which models were formerly manufactured by Servel.

This was announced jointly by Fred C. Schnacke, president of the new firm and George S. Jones, Jr., vice-president in charge of sales for Servel, who added that Servel will concentrate their production on 1/5 to 5 horse power condensing units in the refrigeration field.

"Servel is selling the large capacity units," Mr. Jones said, "to make way for a big expansion program in the making of smaller electric refrigeration condensing units." He said Servel will increase production tremendously during 1946 in their electric refrigeration division which manufactures the one-fifth to five horsepower refrigeration units.

The officers of the new firm are Fred C. Schnacke, president; Walter H. Schnacke, vice-president and also president and general manager of the Schnacke Manufacturing Corporation; and L. H. Quigley, secretary-treasurer, formerly associated with the THM Electrical Company, one of the contractors of the Evansville Shipyard.

The manufacturing will be done by Schnacke Manufacturing Corporation of Evansville, who have specialized in the manufacturing of precision products for many years and will manufacture a line of well-engineered and precision-built compressor units.

"In offering this Servel-engineered compressor unit, which has proved itself in operation a number of years, we will have without doubt one of the best on the market," according to Mr. Schnacke. It will be sold under the name of Schnacke without any connection whatsoever with Servel.

NO DECISION ON BRONAUGH-POTTER PATENT

FEDERAL JUDGE JOHN KNIGHT reserved decision in Buffalo, N. Y. on a motion by the Refrigeration Patents Cor-

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Just Mail In Controls — We Handle The Rest

COMMERCIAL—DOMESTIC—INDUSTRIAL

One Year Guarantee
Each Control Reset and Cycle Tested

Domestic Cold Controls (Modern Type)	$2.00
Commercial Controls (Pres. or Temp.)	2.50
Commercial Dual Controls	3.00
Automatic Water Valves	2.00
Automatic Expansion Valves	1.75
Thermostatic Expansion Valves	3.00

All Prices F.O.B. Chicago and subject to change without notice.

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No.	Width Jaws	Depth Jaws	Jaws Open	Weight Pounds	Base Opening	Price F. O. B. Factory
350	3½"	3"	2½"	9½	3"	$38.75
360	3½"	3½"	3½"	11	3½"	34.75
380	5"	3½"	5"	25	5"	89.75

Order from your dealer or jobber. Write for circular No. 350

CHICAGO TOOL AND ENGINEERING CO.

Mfrs. of PALMGREN PRODUCTS for over 25 Years

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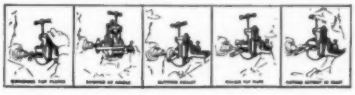

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Your continued patronage is our greatest business asset. Our complete stock of supplies and parts are also an asset to your business by being ready to supply your needs. We are pledged ever to render an increasing service to your customers by prompt shipment of your orders.

Distributor for
PAR CONDENSING UNITS

809 WEST 74th STREET

Automatic
HEATING & COOLING SUPPLY
(Division of Weil-McLain Company)

647 W. LAKE ST., CHICAGO 6, ILLINOIS

poration of Buffalo requesting dismissal of a suit filed by the General Electric Company of Schenectady for a declaratory judgment holding a two-temperature refrigerator it contemplated manufacturing would not infringe the so-called Bronaugh & Potter patent.

Attorney Charles H. Walker, representing General Electric, argued that the refrigeration system contemplated is "wholly different" from that covered by the patents held by the Buffalo concern. Attorney Lawrence Bristol seeking dismissal of G. E.'s suit, asserted that no issue has been created because the two-temperature refrigerator has not been produced. He asked that the court dismiss the G. E. suit for lack of jurisdiction.

NEW KEROTEST CATALOG

A COMPLETE line of refrigeration and air conditioning valves, fittings and accessories is described and illustrated in a new 16 page Catalog 45-R, published by Kerotest Manufacturing Company, Pittsburgh 22, Pa.

All types of valves and fittings are well illustrated with many interior views and line drawings showing the inner sections and working parts, in full detail. Pertinent specifications are given with each valve, fitting and accessory, together with list prices and catalog numbers, for easy ordering.

A copy of this new Catalog is available upon request from the manufacturer.

NEW KELVINATOR PLANT PLANNED FOR ARGENTINA

THE formation of a company which will construct a new plant at Buenos Aires for the fabrication of Kelvinator refrigeration products, ranges and other household appliances for distribution throughout the Argentine Republic, was announced today by George W. Mason, President of Nash-Kelvinator Corporation.

The new company, capitalized for two million pesos, was organized by a group of leading Argentine business men, who were enfranchised by the Corporation today. The company will be known as Darkel, S. A., according to E. H. Wilcox, Kelvinator Export Manager, who returned recently from Buenos Aires where he made studies of the post war Argentine market.

"The new assembly plant will produce refrigerator cabinets and a complete commercial refrigeration line, in addition to other household appliances, for which Argentina offers an ample market," Wilcox said.

"This is especially true now since imports of refrigeration equipment have been paralyzed as a result of the war."

R. J. Hermitte, General Sales Manager of the new enterprise, signed the franchise here. He was accompanied to the United States by the new Argentine company's chief engineer, T. L. Lagos, who is now studying production practices in the Michigan Kelvinator Plants.

R. C. HOOD ELECTED SECRETARY OF ANSUL CHEMICAL

ROBERT C. HOOD, who received his discharge in November from the U. S. Coast Guard in which he had the rating of lieutenant and who saw service in the Pacific on a combat cargo ship, was elected secretary of Ansul Chemical Company, Marinette, Wisconsin, at the firm's annual meeting of the board of directors December 10.

Hood, younger brother of F. J. Hood, Ansul's vice president and president of the Refrigeration Equipment Manufacturers Association, was associated with the firm before he entered the service in 1943. He rejoined the company following his discharge.

Other officers re-elected were H. V. Higley, President, F. J. Hood, vice president, J. F. Asell, treasurer, and Mrs. F. G. Hood, mother of Robert C. and F. J. Hood, chairman of the board.

KELVINATOR BOOK OFFERS YARDSTICK FOR SALES CAREER

FROM the experiences of one of the nation's leading salesmen who entered the sales field after serving as a marine captain in France during World War I has come an effective new career yardstick for thousands of young men being released today from the armed forces and from war jobs.

"To a Young Man in Search of His Future," a self-evaluation handbook for prospective salesmen prepared by Kelvinator, stems from the experiences of Charles T. Lawson, vice-president of Nash-Kelvinator Corporation in charge of Kelvinator sales.

Like tens of thousands of other young men, Mr. Lawson entered a competitive civilian world after World War I. Although

POWERED BY Servel

identifies a discriminating customer—one who is satisfied with only the best. Give him better service by using only genuine Servel parts. See your local Servel distributor or authorized parts jobber.

Electric Refrigeration Division **SERVEL, Inc.** **Evansville 20, Indiana**

Control REPAIR SERVICE

We completely disassemble controls, clean, test, check and replace defective or broken parts, adjust and set for proper temperatures.

Domestic Cold Controls (Modern).....$2.25
Commercial Controls (Pres. or Temp)..... 2.75
90 day guarantee ★ Prices F.O.B. Chicago
Prompt ★ Efficient ★ Reliable Service

Refrigeration Control Service
(Not Incorporated)
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Says GASKET JOE

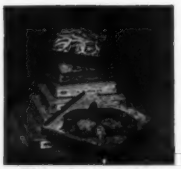
I GIVE ORCHIDS BY THE BASKETS TO THE BOYS WHO CHECK DOOR GASKETS

3-A

JARROW PRODUCTS
420 N. LA SALLE ST., CHICAGO 10, ILLINOIS

GASKETS

GASKETS



Write for complete catalog.

• Play safe and specify CHICAGO-WILCOX gaskets for every refrigeration need. Our complete gasket service provides a dependable source of supply to meet your requirements. Get full details today.

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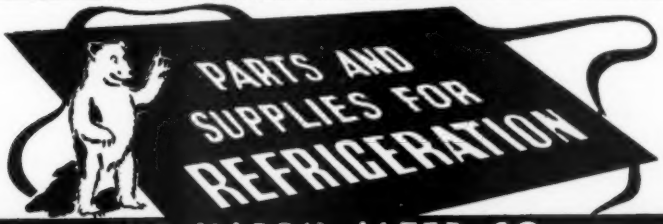

THE HARRY ALTER CO.

★ 1728 S. Michigan Ave. Chicago, Ill. Two Big Warehouses to Serve You 134 Lafayette St. New York, N. Y. ★

he was an engineer by training, he decided to enter the sales field and became highly successful in it.

CHARLES T. LAWSON
Nash-Kelvinator Corp.

Kelvinator, guided by Mr. Lawson's experiences and the great opportunities for World War II veterans in the selling field, made an intensive study of what it takes to make a good salesman, placing emphasis on self-evaluation.

In outline, the booklet contains a discussion of the general nature of the sales profession, a "profile" of the successful salesman, a terse examination of the incentives, the future, the security and other elements of selling, and—as a highlight—a carefully prepared test by which the individual may measure his aptitude for selling.

WESTINGHOUSE PREPARES FOR INCREASED DEMANDS

AMERICAN industry today is placing more and more emphasis on mechanization—and mechanization means motors.

To meet the tremendous demand, the 200,000 horsepower of driving force being turned out every month in the Motor Division of the Westinghouse Electric Corporation at East Pittsburgh is expected to soar to perhaps 300,000 horsepower when operations reach full swing in the new plant at Buffalo, N. Y.

About 6,000 persons will be employed there compared to the 4,000 now in motor production in the parent plant. Motor production will run more than 80 per cent higher than in the peacetime years of 1937-1939, and about 50 per cent above the peak year of 1940, according to latest estimates by Company officials.

Development work on motors, delayed by the war, has resumed its stride with the coming of peace.

Extensive Developments Going Forward

"The attack at Pearl Harbor," Leon R. Ludwig, manager of the Motor Division disclosed, "brought an abrupt stop to many new developments in the field of motors in the interest of maximum production for the war effort. Now we are going ahead with the perfection of these new motors in the most elaborate development program ever undertaken by Westinghouse."

The manager revealed an acute need for single phase motors for service and comfort purposes—to drive compressors, pumps, fans, blowers, refrigerating units, air conditioning systems and home stokers. Flexibility, he explained, has been the watchword in the design of new motors. The aim is toward motors which can be applied to a number of purposes rather than one specific application.

Plans for 1946 Products

Plans for the promotion of the complete line of 1946 electrical appliances made by the Westinghouse Electric Appliance Division were reported to the wholesale salesmen associated with the Division's distributor organizations, at a week long sales meeting at Mansfield, Ohio, the first held for this group since 1941.

J. H. Ashbaugh, Westinghouse vice president in charge of the Appliance Division, told the group that it is the "firm conviction" of the Company that the manufacturer-distributor-dealer method of distributing goods is "fundamentally sound," and Westinghouse will stand back of that method of distribution.

He also said that with the completion of the Company's $6,500,000 expansion program at Mansfield by June of next year and with production at peak capacity, the plant will employ 7,500 men and women to mark the full start on the "second thirty million appliances" to be made by the Company.

Indicating the new size of operations to be in force at Mansfield, Mr. Ashbaugh said that a trainload of 150 freight cars will have to enter and leave this plant each day to handle production. Twelve carloads of steel will be required each day to meet produc-

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FOR REFRIGERATION AND AIR CONDITIONING

One stop supply service — Everything for the Refrigeration Serviceman.

CHASE REFRIGERATION SUPPLY CO., Not Inc.

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SERVICE MEN—

ADDED PROFITS ARE POSSIBLE

Eliminate the lost time from service calls by using our repair service on compressors. We specialize in prompt efficient workmanship on your compressor repairs. 90 day guarantee—Reasonable prices.

We do not repair Hermetic units.

Write for quotations to

Keystone Engineering Corp.

844 Keystone Ave., Chicago 51, Ill.

Phone: BELmont 5435

BETTER BUYERS

Specify

SHANK

DEHYDRATORS

Refrigeration men who know specify Shank Dehydrators because they are low in cost, light weight, modern design with leak proof joints.

ELIMINATE REFILLING

The low cost of Shank Dehydrators makes it more economical to replace used dehydrators than to refill.

Two sizes: Large—2" O.D., ¼ & ⅜" M. Flare—8½" and 8⅝" overall length. Small—1⅜ O.D. ¼" M. Flare—5⅛" & 7⅛" overall length. Furnished complete and filled with Calcium Chloride, Activated Alumina or Silica Gel.

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Write today for prices.

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A NEW SERVICE FOR YOU

Refrigerator coils, air cooled condensers, evaporators, dehydrators and low side floats expertly repaired and thoroughly cleaned.

Prompt service. 90-day guarantee.

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STANGARD

Prime Surface **COLD PLATES**

For Maximum Refrigerating Efficiency

THE STANGARD DICKERSON CORP.

46-76 Oliver Street · Newark 5, N. J.

tion demands. A carload of nails will be used every five days just to crate the appliances as they roll off the manufacturing lines.

Pointing out that the Appliance Division has kept up to and, in a number of cases, ahead of projected reconversion schedules, the vice president said:

"If we can continue on schedule, we will be up to prewar refrigerator capacity in seven months after the end of the war, which is one month better than the time table we set up for this task. Electric irons, vacuum sweepers, fans and electric roasters and a few other appliances were started more quickly, while ranges, laundry equipment and some other small appliances have taken much longer."

S S S

ARLEY BAKER NEW ALCO ASSISTANT SALES MANAGER

ARLEY L. BAKER has been appointed assistant sales manager of the Alco Valve Company, St. Louis manufacturers of refrigerant control valves. Formerly application engineer for the company, he will continue to devote most of his time to the field work in which he has a wide and varied refrigeration background.

A. L. BAKER

Mr. Baker came to Alco more than a year ago from Curtis Manufacturing Co., where he had been district representative of the north central territory since 1939.

Previous to that time, from 1930 until 1939, he was a partner in the Machinery Service Company, St. Louis. His first position after leaving the University of Illinois, where he studied engineering, was with Midcontinent Equipment and Machinery Co., also of St. Louis.

S S S

G. E. CO. ANNOUNCES NEW REFRIGERATED DISPLAY CASES FOR WHITMAN'S CANDY

A NEW line of refrigerated candy display cases, featuring modern cabinets and new designs in refrigeration and cooling systems will be constructed for Stephen F. Whitman and Sons, Inc., of Philadelphia, manufacturers of Whitman's Candy, by the General Electric Company, it was revealed today by C. M. Rowland, G.E.'s Manager of Packaged Cooling Equipment Sales.

The new Whitman's display cases will be constructed by the General Electric Company's Air Conditioning Department, Bloomfield, N. J.

S S S

HONEYWELL ANNOUNCES PLAN TO EXPAND FOUR FACTORIES

A $3,500,000 expansion program involving additions to plants and machinery in four United States and Canadian cities is announced by Minneapolis-Honeywell Regulator Company. Needed to handle expanding sales in all company divisions, the new program follows purchase of a ten-story Minneapolis factory and the addition of four floors to the main plant during the war years, Harold W. Sweatt, president, stated.

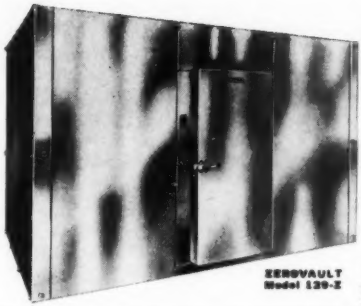
Included in the program is the construction of a new wing to the main plant in Minneapolis which will add approximately 120,000 square feet of manufacturing space to current facilities, he said. Company operations in Chicago, Toronto and Philadelphia also will be enlarged either by the purchase of existing buildings or the addition of floor space to current structures. The building program will be started immediately, he said, while negotiations for the purchase of machinery to be housed in the new buildings has already begun.

Manufacturing more than 3,000 different heating, ventilating and air conditioning controls, Honeywell recently announced a number of new products which never before were available on the consumer market, Sweatt said. Among these are new heating control systems which eliminate drafts and cold floors in single family dwellings, systems of personalized heating controls for apartments so that each apartment dweller may have control over the amount of heat delivered to his living space.

S S S

WESTERN THERMAL EQUIPMENT CO. MOVES TO NEW PLANT

CHANGE to larger quarters by Western Thermal Equipment Company, manufacturers of Visoleak leak detection fluid for refrigerant systems, is announced by G. B. Bloom, President.



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STORAGE FOR FROZEN FOODS

● **ZEROVAULT** has a significant place in our stepped-up production schedule of low-temperature equipment.

● **Sectional** in construction, **ZEROVAULT** is easily erected in otherwise inaccessible places . . . is easily enlarged to care for expansion of frozen food distribution facilities. Get full details **NOW . . . Write Dept. 14.**

WILSON REFRIGERATION, INC.
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60 Cycle 110-220 V.
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Address of the new location is 1701 West Slauson Avenue, Los Angeles 44, California. The new location provides desperately needed additional space to consolidate office, factory, warehouse and shipping facilities in one location, and facilitate further expansion of the company. Production has been started on Visoleak charging sets, for injecting Visoleak or refrigerant oil into systems. Other specialty items for the refrigeration trade are planned for production in 1946.

The property, owned by Western Thermal Equipment Company but unavailable to it until recently, due to occupation by other concerns producing war materials, includes office building and separate factory and warehouse, with 240 feet frontage on Slauson Avenue.

A. H. HOLCOMBE DECEASED

ALEXANDER H. HOLCOMBE, 72, who retired two years ago as Philadelphia representative for the Worthington Pump and Machinery Corp., Harrison, N. J., died Dec. 4 at his home in Cynwyd, Pa.

Mr. Holcombe became associated with Worthington in 1934 when it absorbed the old Carbondale Machine Co. of Carbondale, Pa., with which he had been connected for 10 years. Previously, he had done engineering work for a number of corporations, after receiving his technical training in summer courses at Harvard University.

He was a member of the Engineers' Club and the Hamilton Club, both of Philadelphia, and of the Bala Golf Club of Cynwyd.

Surviving are one son, Alexander H. Holcombe, Jr., three daughters, Mrs. Louise H. Boyd of Chevy Chase, Md., Mrs. Malvina K. Trotter of Merion, Pa, and Mrs Adelaide R. Furman of Norwichtown, Conn., and a brother, E. N. Holcombe of New York.

WEATHERHEAD OF CANADA WILL MAKE AND SHIP OWN PARTS

EFFECTIVE at once standard parts for the Canadian industrial and refrigeration industries will be made and shipped to the Canadian trade by its subsidiary company, The Weatherhead Company of Canada, Ltd., at St. Thomas, Ontario, it has been announced by the Weatherhead Company of Cleveland, O.

"This is in line with our policy to make the Canadian Company entirely self-supporting and supply additional employment for Canadian workmen," said A. J. Weatherhead, Jr., president of The Weatherhead Company.

Fred M. Hogle & Company will continue as Sales Representative of the Automotive Jobbing Division in Canada and will carry extensive warehouse stocks at both Toronto and Montreal.

All exports to any of the countries of the United Kingdom will also be manufactured and shipped from the St. Thomas plant.

The Weatherhead Company is the world's largest manufacturer of automotive and aircraft tube fittings, flexible hose, and hose assemblies.

HUDZIETZ TO REPRESENT HENRY VALVE IN EAST

C. W. HUDZIETZ, well known refrigeration sales representative, has been placed in charge of an eastern outlet for products manufactured by the Henry Valve Co. of Chicago. Offices are located at 5618 Grand Central Terminal, New York City. No stocks will be carried at this eastern address as adequate stocks are now maintained by leading refrigeration jobbers in all important cities.

C. W. HUDZIETZ

CHANGES IN WAGNER BRANCH PERSONNEL

WAGNER ELECTRIC CORPORATION announces the following changes in service branch personnel:

Forrest G. Wilson, formerly a salesman at the Dallas branch, has been appointed manager of the Indianapolis branch.

H. F. Zahn, formerly manager of the Atlanta branch, has been made manager of the Philadelphia branch.

C. G. Jackson, formerly manager of the Boston Branch, has been moved to Atlanta to manage that branch.

J. K. Miller, heretofore a New York branch salesman, has taken over the management of the Boston branch.

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Commercial Controls (Temp. or Pressure)	2.75
Commercial Dual Controls	3.50

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THE AUTO-DIESEL PISTON RING CO.

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